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Eberhardt's Improved Automatic Gear Cutter.

We present upon this page, and on page 2, engravings of this machine, which is built by Gould & Eberhardt, Newark, N. J. Since illustrating the machine as made at the time of our issue of March 31, 1883, it has been by no means thought "good enough" by the inventors, but such changes and alterations as have shown themselves to be of merit, have been adopted, which have led to improvements in the whole general construction.

The main frame being one casting, is very stiff, with the metal well distributed where most needed, to withstand the severe strains in cutting wheels of large diameter and coarse pitches. Upon the horizontal ways, which are accurately scraped, fits a slide, upon which works the cutter slide. The lower slide is worked horizontally by means of a screw, which is especially useful when cutting bevel gears having long hubs cast on them, as the whole working slide can be brought out to the face of the gear. The cutter slide, and all other working slides, have been enlarged in length and wearing surface.

The mechanism for operating the cutter slide is of an entirely different construction from the one formerly employed, and affords more wearing surface to the parts, and works to better advantage. Through this arrangement an unlimited variation of speed can be obtained for feeding the cutter through the various metals, viz.: steel, wrought iron, cast-iron and brass. It is also essential that there should be variable feeds adapted to these principal metals, both as to economy in cost of production and the duration of the milling cutter, which in most instances is valuable. This is accomplished by using any one or combination of the forty-eight regular change wheels, which produces a feed not dependent entirely on the friction of belts, etc., when cutting coarse pitches.

The construction of the cutter arbor bearing is such that the greatest firmness and wearing capacity are obtained when cutting, as well as the convenient and exact adjustment laterally of the arbor, to suit various thicknesses of cutters.

The bearing, which is square in shape, and adjusted by means of rack and pinion, is in halves and scraped a perfect bearing to arbor. A self-oiling arrangement, whereby the entire length of arbor is kept continuously oiled, is also attached. The cutter arbor is strongly geared. The cutter slide is elevated to the various angles of degrees, by a worm quadrant. The various degrees are accurately given on the opposite quadrant.

The sliding head is large in all its proportions, working in accurately fitted ways its entire length.

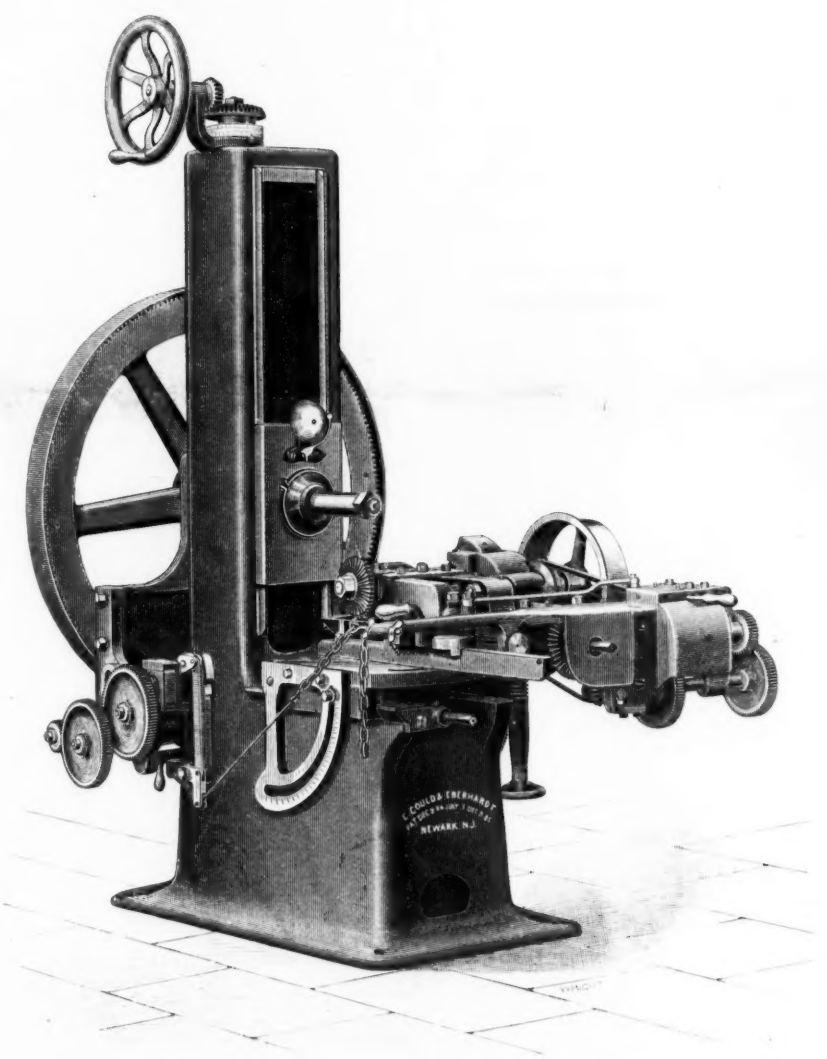
The barrel on a 60″ machine is $4\frac{1}{8}$″ diameter, the spindle or mandrel being $2\frac{3}{16}$″ diameter. The head is adjustable vertically by means of a screw, to the $\frac{1}{1000}$ part of an inch.

In all machines of this nature the accuracy with which a blank is spaced is dependent entirely upon the worm wheel (provided all other parts are perfect) which in some instances is overlooked and the wheel made too small in diameter in proportion to the range of wheels to be cut.

This has been in a measure remedied on the large machines, where inaccuracies are most appreciable, by materially increasing the diameter; this, together with constructing the wheel in two sections securely bolted together, insures a true dividing wheel, whereby the most deceptive inaccuracies are detected.

An iron casing protects the wheel from dirt and foreign particles, which are apt to lodge in the teeth when unprotected.

The worm shaft is of steel; the bearings are adjustable for compensating any lost motion which might take place, or the worm may be withdrawn from the dividing wheel entirely, which is desirable for testing large wheels.



EBERHARDT'S IMPROVED AUTOMATIC GEAR CUTTER.

The lock shaft always makes one revolution; the proper spacing is accomplished through the change wheels. The worm-wheel is held locked for the cutting of each tooth, and where properly set mistakes cannot occur.

All slides and adjustments are graduated. These machines are made in five sizes ranging with a capacity of cutting from 25″ to 84″ in diameter, and will perform equally as well at their greatest capacity on coarse pitches as on smaller diameters and the finest pitches.

The engraving on page 2 represents the new 18″ automatic gear cutter for cutting spur gears. It has worm dividing wheel in two sections, same as the larger machines; a quick adjustable dial feed, very quick return of slide, etc.

Cone on machine and countershaft enables operator to get desired speed of cutter for different metals and pitches to be cut. It is calculated for those desiring an accurate machine for spur gears from 18″ down to 0, and to cut from 6 diametral pitch down to the finest. The column is hollow and provided as a receptacle for change wheels and cutters.

The receipt of numerous communications asking as to the relative cost of petroleum and coal for steam-making leads us to say once again that there is no evidence that oil will not cost nearly twice as much as coal in and near coal-producing districts. It is only when coal has to be carried long distances that oil can be economically substituted for ordinary steam-making purposes.

Many a machine is ruined in reputation by being placed in the hands of incompetent users. The following from a book published by well-known manufacturers expresses more truth than is usually found in the same number of lines: We do not particularize; it is unnecessary: "If the reader has carefully followed the construction of the machine up to this point he may see little else, if anything, to be done towards securing a long-lived machine, yet our part as builders secures but one-half this object. The other half must be attended to by the user of the machine. However well a machine may be constructed, if it is not properly cared for it will soon become unreliable, if not worthless."

Mixture for Rolls.

BY S. BOLLAND.

The question is often asked by foundrymen "What is the best mixture for rolls?" and again, "Why cannot we have a 'regular' set of mixtures, gotten up by some one who has had large experience in this class of work?" Go where you will, you are met by these enquiries, and (strange as it may seem) no answer comes, at least none that is intelligible to the average moulder. Some have tried to give what purported to be the right mixture, made up of so much of "this," to so much of "that," supplementing the formula by saying that good rolls were made at such a place by the mixtures given. Again, you go into shops where they make a specialty of rolls, and ask for their mixtures, and naturally, they shake their heads, and express by the look they give, as well as they could by a multitude of words, "Not much." Now this is very discouraging to the seeker for information, and yet it is not wondered at when we take into consideration the amount of labor and study which has been devoted to the subject, by those engaged in the business, and it is not too much to say that even the best informed on the subject are very far from perfection, inasmuch as they are constantly called upon to change their mixtures on account of the variations in the different shipments of iron. To attempt to give a formula for universal adoption by saying, "So much of No. 2 to so much of No. 5, and so on," is sheer nonsense, for the simple reason that when you receive a consignment of iron from the furnace which was ordered to be No. 4, you will find that no less than three or four grades of iron have been shipped to you, making it utterly impossible to follow any prescription, based on the number of the iron alone. The trouble can be overcome after this manner:

After first settling in your own mind what particular grade shall be called No. 1 and No. 6, with their intermediate numbers according to grade, you may then make from your own experience mixtures that will be intelligible to yourself, but would be useless to any one unacquainted with your methods of numbering. But this is not all that enters into the successful making of rolls, or anything else that requires special mixtures If it were at all times profitable and convenient to use new iron, the business might soon be learned by adopting the method suggested above.

All foundrymen of experience are aware that large quantities of scraps (from broken rolls and other castings made from charcoal iron) accumulate and must be worked up, and it is right here that the skill and judgment of the mixer is put to the test, and I know of nothing which demonstrates the impractibility of making a set of standard mixtures more than the fact that whilst some of the scrap may be open grained and very soft, other specimens will be perfectly white and brittle as glass, and yet some of our experts insist on their mixtures being correct, which tell you to put in a certain proportion of scrap. Again, it is common amongst moulders to say when a roll turns out too soft, or the opposite, "Oh, there ought to have been a little more 'car wheel' in that mixture;" or a little less "car wheel," as the case might be; as if car wheels were a something on which the greatest reliance could be placed,

for being always one thing in point of density or hardness. A little observation on these points will at once dispel this illusion, for whilst some wheels may be chilled almost 1″ deep; others again will be found hardly touched with chill, and the iron all through as soft as lead almost.

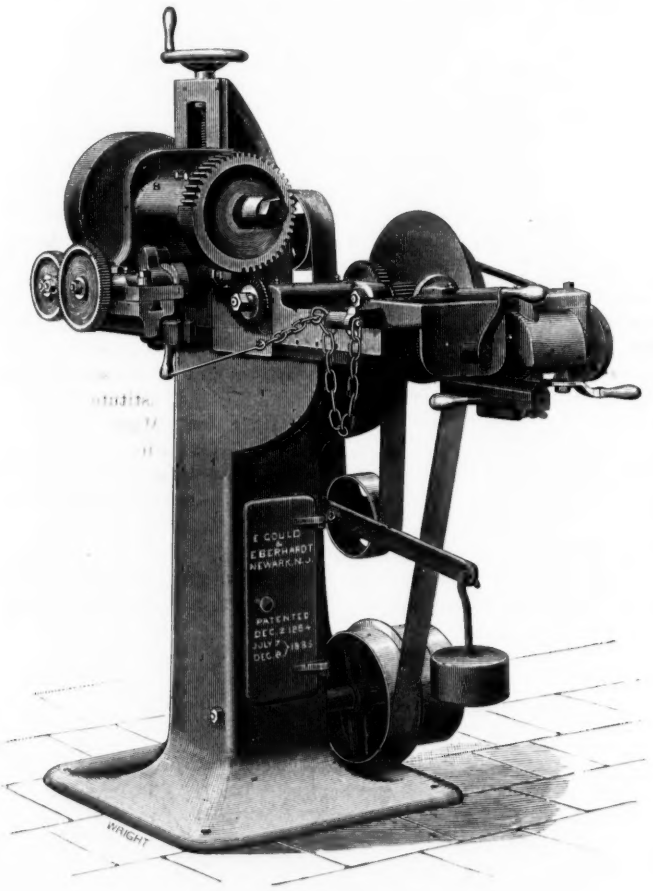
Again I would call the attention to this fact, that full reliance cannot be placed on the productions of our best firms in this line of business. I have seen four rolls all of the same dimensions, which came from a leading firm, no two of which were alike in density. One was almost condemned for being too hard; the softest being as much in fault the opposite way. I mention this to show that however much may have been accomplished in the way of mixtures, much still remains for the judgment of the mixer; for, as is well known, a judicious selection of scrap in large quantities will always produce the finest casting, and, if possible, new iron should never be used exclusively. Many may think that it would be easy to mix sufficient very hard grade new iron to neutralize a very soft one. This plan will never succeed. The result of such a mixture is always a pronounced mottle, large and unsightly, the white and dark patches seem never to have united. Such rolls last but a very short time for, as soon as they are put to use, the soft parts crumble out, leaving the roll perfectly honeycombed. This proves the necessity of using iron in the mixture not too far apart in their nature and degree of density, and of choosing such grades as are the nearest to the mixture required. A good plan is to melt together your very hard and soft scrap, and run down into good sized pigs, say 6″ or 8″ square. The reason for this is that where small pigs are made for charcoal scrap, the result is "white iron," which as a rule you do not want. All overflows from casts should be run in like manner and covered over as soon as run. By adopting this method a great saving is effected.

I shall now proceed to give a few mixtures for different sized rolls, and to make them intelligible to the reader it will be necessary to inform him what is meant by Nos. 3, 4 and 5, as the case may be. These several numbers represent the grades as arranged for my own convenience in mixing.

For instance, No. 3 means a close, even-grained, clear, bright iron, entirely free from the slightest trace of chill. This iron if of a good brand will be hard to break, and when broken will show a clean fracture straight across the pig. (I would here call the readers attention to the fact that Salisbury charcoal iron forms the basis of these mixtures, being, in my opinion, the best iron for rolls.) By No. 4 I mean an iron very similar to the No. 3 in the center of the pig, but about an inch from the edge all round it assumes a darker hue of a blueish cast, and much closer in grain with a tendency to chill at all the corners. This iron will be still tougher than No. 3, but must have no trace of mottle in it. By No. 5 I mean an iron having the center of pig the same grain as the 1″ round the No. 4 pig, the rest being mottled and having its surface chilled to the depth of $\frac{3}{8}$″ or $\frac{1}{2}$″. By a faithful adherence to the descriptions of the numbers it will be easy to arrange the following mixtures, all of which I consider "standard," having used them myself with unvarying success. They are the result of a patient study of the subject aided by an extensive series of experimentary practice. As will be seen I give more than one mixture for the same sized roll, which enables the mixer to regulate his mixture according to the iron he may have by him. It will also be observed that I describe the nature of the scrap used as well as the car wheels; these are important items and must be carefully noted; as, for instance, by "low" car wheel, I mean such as have not more than $\frac{1}{4}$″ chill on the face; by "medium" car wheel about $\frac{1}{2}$″, and by "high," I mean such wheels as are chilled from $\frac{5}{8}$″ to $\frac{7}{8}$″. The scrap I also distinguish by grades in a similar manner, and as scrap is made up of a miscellaneous lot of old iron, such as pieces of rolls, necks, etc., also such scrap as is made in the foundry, including all grades of hardness, it becomes imperative that the closest scrutiny should be made of such, assorting and grading it as directed. By "low" scrap, I mean such as shows neither chill nor mottle. "Medium" is intended for all scrap which is mottled, but only slightly chilled, whilst "high" means that which is deeply mottled with considerable chill. By noting carefully these particulars, the table of mixtures given below will be intelligible:

	No. 3.	No. 4.	No. 5.	Scrap, Low.	Scrap, Medium.	Scrap, High.	Car Wheel, Low.	Car Wheel, Medium.	Car Wheel, High.
	lbs.	lbs.	lbs	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
For 10″ and 12″ rolls, with 5″ and 6″ necks	....	1000	....	1000	....	....	....	....	....
Another	500	600	150	....	....	....	425	..	....
For 15″ rolls, with 10″ necks.	160	940	....	....	900	....	....	....	....
Another	....	1350	....	....	..	....	....	650	....
For 20″ rolls, with 11″ necks.	....	1100	....	450	....	....	....	....	450
For 22″ rolls, with 17″ necks.	....	920	165	....	500	....	....	415	....
For 25″ rolls, with 11″ necks.	....	000	....	200	300	....	300	300	300
Another	300	1100	100	100	200	200	....	....	....

These mixtures are so many pounds to the ton of 2,000 lbs., and may be modified to suit circumstances, as, for instance, scrap may be substituted for wheel of the same grade, or *vice versa*.



GEAR CUTTER.—*See page* 1.

The Constituents of Cast-Iron.

We take the following abstract of a paper on the above subject from the *Engineer*. The paper was presented to the Iron and Steel Institute by Mr. Turner, demonstrator of chemistry, Mason College:

"The most important feature in this paper was the announcement that it was possible, without any extra expense, to impart to all cast-iron a tensile strength of at least fifteen tons per square inch, or nearly double that on which it is now safe to reckon. In order to do this, it is only necessary to have sufficient silicon in the metal. The author's own experiments were made with iron of more than usual purity, specially prepared by heating South Staffordshire wrought iron in crucibles with charcoal. The product was then mixed with various amounts of silicon pig, and the resulting metal examined chemically and mechanically. The materials employed had the following composition:

Description.	Total Carbon.	Graphite.	Si.	P.	Mn.	S.
Original cast-iron..	1.98	0.38	0.19	0.32	0.14	0.05
Silicon pig.	1.81	1.12	9.80	0.21	1.95	0.04

The total carbon was purposely kept as nearly as possible constant at 2 per cent., so as to obviate any uncertainty due to variations in that element. The only element other than silicon which varied to any considerable extent was manganese; but in this case the alterations were rather less than one-fifth of the variations in silicon, and would not appear to have introduced an appreciable error. In the table annexed the results of his experiments are collected together for the first time. In addition to what has been previously published, there is added a specimen containing 1.4 per cent. of silicon, as that appeared from his earlier experiments to be of considerable interest. There is also given the calculated transverse strength, which is of importance in connecting together tensile and crushing strength. The tensile and crushing tests were performed by Professor A. B. W. Kennedy, of University College, London, while he was indebted to Mr. J. P. Walton for assistance in the analytical part of the work.

The crushing strength also shows a very considerable uniformity, the only exception being the 2.5 per cent. specimen, which is probably rather too high, owing to the small amount of graphitic carbon. The maximum value of 92.54 tons was obtained with one per cent. of silicon. This value, though greater than is usual with cast iron, has been exceeded by Sir W. Fairbairn, who in 1853 recorded a crushing strength of nearly 96 tons.

The author concluded—(1). That pure cast iron—*i. e.*, iron and carbon only—even if obtainable, would not be the most suitable material for use in the foundry. (2.) That cast iron containing excessive amounts of other constituents is equally unsuited for foundry purposes. (3.) That the ill effects of an excess of one constituent can at best be only imperfectly neutralized by the addition of another constituent. (4.) That there is a suitable proportion for each constituent present in cast iron. This proportion depends upon the character of the product which is desired, and upon the proportion of other elements present. (5.) That variations in the proportion of silicon afford a trustworthy and inexpensive means of producing a cast-iron of any required mechanical character which is possible with the material employed.

"Marine engine builders," said a well-known engineer, "are apt to meet strains in marine engines by opposing to them an unyielding force." Locomotive builders, on the other hand, allow parts to move and adjust themselves, a point which marine engineers cannot adopt, or even comprehend. Said he, "the best marine engine I ever had made was built in a locomotive shop."

We have received, through the courtesy of Professor Swain, a circular explanatory of the civil engineering department of the Massachusetts Institute of Technology. Judging from the circular, the course of civil engineering, as arranged, is very complete, and is made practicable by a large amount of out-door work. We note, from an outline of some of the more important branches, that the subject of hydraulics and hydraulic engineering is given the prominence due it; also that sanitary engineering is well considered. The subject of railroads is very thoroughly embraced in the general course, from reconnaissance to final completion. In this branch the field work embraces actual location of several miles of road, with complete plans and careful estimates.

One of the most important features of the department of civil engineering is the introduction of option. As an example, students who propose to follow railroad work after graduating may, if they desire, pursue this branch beyond what is embraced in the general course to an extent including about everything connected with railroad operating, management and maintenance. The same is true of other subjects which the student is specially desirous of pursuing exhaustively.

TABLE A.—*Effect of Silicon on the Properties of Cast Iron.*

Silicon, per cent. (calculated).	Relative density at 20° C. (Water at 20° = 1.)		Relative hardness.	Tensile strength = per square inch.		Modulus of elasticity.	Crushing strength per square inch.		Calculated transverse strength. Bars 1 ft. long, 1 in. square, loaded in the center.		Chemical Analysis.						
	Cylinders.	Turnings.		lbs	Tons.		lbs.	Tons.	lbs.	Tons.	Total carbon.	Graphite.	Combined carbon.	Silicon.	Phosphorus.	Manganese.	Sulphur.
0	7.560	7.719	72	22,720	10 14	25,790,000	168,700	75.30	2702	1.206	1.98	0.38	1.60	0.19	0 32	0.14	0.05
0.5	7.510*	7.670	52	27,580	12.31	28,670,000	204,800	91.42	3280	1.464	2.00	0.10	1.90	0.45	0.33	0.21	0 05
1	7.641	7.630	42	28,490	12.72	31,180,000	207,300	92.54	3370	1.504	2 09	0.24	1.85	0.96	0.33	0.26	0.04
1.4	7.555	7.473		31,440	14.04	23,500,000	183,900	82.08	3498	1.561	2 21	0.50	1.71	1.37	0.30	—	0.05
2	7.518	7.350		35,180	15.70	23,560,000	137,300	61.29	3446	1.538	2.18	1.62	0 56	1.96	0.28	0 60	0.03
2.5	7.422	7 388		32,760	14.62	25,450,000	172,900†	77.18†	3534†	1.577†	1.87	1.19	0.68	2.51	0.26	0 75	0 05
3	7.258	7.279		27,390	12.23	21,150,000	128,700	57.45	2850	1.272	2.23	1.43	0.80	2.96	0.34	0.70	0.04
4	7.183	7.218		25,280	11.28	15,640,000	106,900	47.74	2543	1.135	2.01	1.81	0.20	3.92	0.33	0.84	0.03
5	7.167	7.170		22,750	10.16	18,720,000	103,400	46.16	2342	1.046	2.03	1.66	0.37	4.74	0.30	0.95	0.05
7.5	7.128	7.138		11,950	5.34	14,750,000	111,000	49.55	1505	0.672	1.86	1.48	0 38	7.33	0 29	1.36	0.03
10	6.978	6.924		10,630	4.75	13,930,000	76,380	34.10	1252	0.559	1.81	1.12	0.69	9.80	0.21	1.95	0.04

* This number is rather low, as the specimen afterwards proved to be somewhat faulty.

† The value in this case is probably exceptionally high; a crushing strength of about 60 tons might be anticipated from its position in the series.

Starrett's Inclinometer.

This tool is designed to be used as an inclinometer, try-square or bevel protractor.

It consists of a cast steel stock and disk, both slotted to receive the blade, which folds in the stock. The blade attached to the graduated rotary disk may be secured at any angle, from 0 to 90 degrees, and by loosening the clamp screw; it may be shortened or extended full length, or removed for a straight edge.

The working face of the stock extending both sides of the blade admits of its being reversed, so that the same angle may be laid off in opposite directions, without changing the angle in the tool, thus requiring but $\frac{1}{4}$ of a graduated circle to obtain all angles both ways.

At 90 degrees, the blade brings up against a case-hardened screw, accurately adjusted, thus forming a try-square, also by holding the blade perpendicular (the level in the stock being at right angles) a plumb. When folded the tool forms a level the length of blade; when opened to any degree of the graduated arc work may be leveled to that incline.

The manufacturer is L. S. Starrett, Athol, Mass.

The contractor who carves out the western tunnel on the Georgia-Pacific, says the *New South*, "made a ten strike." He receives, of course, the usual pay for "dynamiting" the great orifice through earth and stone, but he had not gone twenty feet into the mountain side till he struck a vein of bituminous coal eight and one-half feet thick. He will take out enough coal to pay thrice the cost of his work, perhaps, and yet receive compensation for stone and earth excavation through the whole length of the great tunnel. Hereafter, President Johnston, of the Georgia-Pacific, will make special provisions for mining privileges when letting contracts in Walker county.

Ball Thrust Bearing.

Thrust bearings have received considerable attention; yet how to provide a bearing which will not absorb a large percentage of engine power, which will not be in danger of running dry and cutting itself to pieces, is a problem not always solved satisfactorily.

The ball thrust bearing illustrated by the engraving was designed by James Sawyer, Rochester, N. Y.

The bearing is here shown as applied to a steam launch, fitted with a 1″ shaft.

The collar *B* is made fast to shaft *A* by two set-screws, which are put in through the hole *F* in cap *E*.

Collar *C* is loose upon the shaft, and is bored large enough to prevent its coming in contact with shaft *A*.

Collar *C* is held in place by lip *D*, which is cast on both box and cap.

A similar collar is fitted at opposite end of the box, and is hidden from sight by cap *E*.

Two pins *G G* hold cap *E*, if bolts *H H* and *J J* chance to get loose.

The bearing is fastened to the boat by bolts through holes *I I I I*, and the thrust between *B* and *C* is taken upon fifteen hardened steel balls, *L L*, which run in grooves cut in collars *B* and *C*.

The clearance space *M*, between collar *C* and box lip *D*, is just sufficient to allow the parts to clear each other, when the collar and balls under *E* are doing work.

If the motion of boat be reversed, *C* will bear against *D*, leaving the collar under *E* free, as *C* is shown in the cut.

No lubrication has yet been required by this thrust bearing, still the holes *K K* have been provided for use in case of emergency.

It looks probable that if collar *C*, box and collar *P* be made in shape of a ball and socket, this thrust bearing might be desirable in large vessels, where the problem must be considered of the shafts continually getting out of line.

This device is not patented, and may be made by all who choose to try it.

The hardened steel balls *L L* are, for this size of bearing, the same as those used in bicycle bearings, and can be obtained of dealers in bicycles.

A Steam Brake.

The North Hudson County Cable Railroad Company also maintain an inclined plane cable road for raising and lowering horse cars and road equipages.

In stopping the hoisting drum a reliable brake was found to be absolutely necessary, and among other devices an air brake was procured which required a $1\frac{1}{2}$″ steam connection with the boiler to enable the brake to work properly.

Ordinary mechanical methods of applying the brake not proving satisfactory, and the air brake being too expensive, a steam brake was devised by Thomas Strickland, which has and is doing the required work well and with economy, and only using such steam as can pass through a $\frac{1}{8}$″ globe valve, open $\frac{1}{6}$ of a turn.

This brake consisted of the usual strap, toggle joint and lever, the end which the steam operated, having a movement of about 26 inches.

The cylinder was 4″x28″; perpendicular, and the stuffing-box was made 6″ long in order that it might serve as a guide to the piston rod, and dispense with crosshead.

The connecting rod, about 8″ long, was welded to the piston, and attached by a pin to a slot in brake lever.

A plain slide valve was used as a throttle and was connected by a rod and lever, with the starter's room above.

When the brake was to be applied the piston must be lowered. The end of the slide valve, which governed upper end of cylinder, was cut in plan like the letter **V**, thus forming a simple graduated valve.

The center of the valve is cut back, thus permitting the edges to cover the port first; the ports are about $\frac{5}{16}$″ wide and 2″ long.

The connection between steam chest and bottom of cylinder is through a very small pipe, less than $\frac{1}{4}$″, thus delaying exit of exhaust, and forming a cushion as the piston is forced down when the brake is applied.

Seeing and Thinking.

Some men would walk through a machine shop and see nothing but lathes, planers and other machine tools, together with a lot of unfinished castings and pieces of machinery.

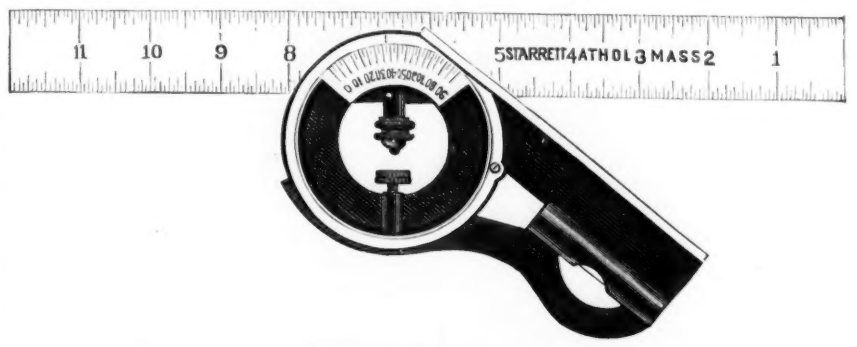
Such men never improve methods of doing work. They never think of a better way to do a job. They plod along, thinking chiefly of killing time until pay day.

Now and then a man comes along who sees things differently. No matter what object meets his eye, the sight of it suggests something. Perhaps the object is nothing but a piece of scrap iron lying on a junk heap. No matter, our "observing man" sees the whole of that piece of iron and it stirs up numberless thoughts and calculations as to how that piece was worn out, what made it wear in that particular manner, and how could it have been made to wear much longer.

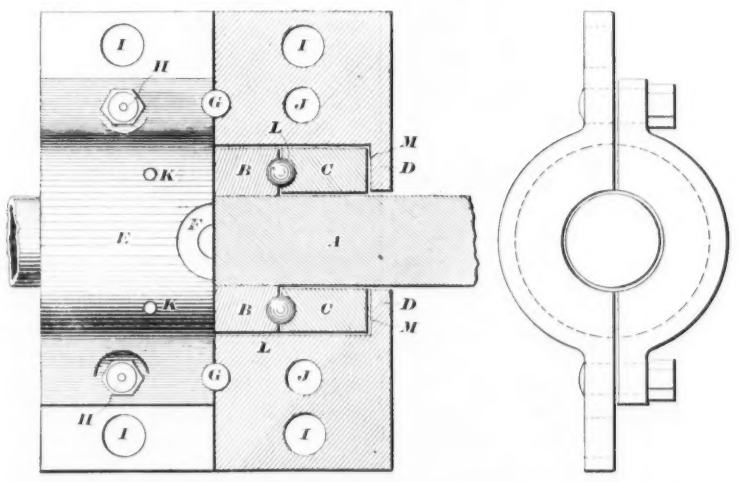
Perhaps the observing man finds an awkward tool expensively employed in doing a job in an indifferent manner. Our seeing man realizes in an instant the disadvantages of that particular tool and at once sets to better the matter.

A piece of bent iron, a twisted wire or some common place object often gives the impressive mechanic a clue to some point upon which he has been studying for a long time.

These men are the ones who make improvements. They are the kind of men needed, and all men should follow their example of trying to see all there is in everything which comes to view, no matter how insignificant or common-place it is.



STARRETT'S INCLINOMETER.



BALL THRUST BEARING.

Fire-Trap Exhibition Buildings.

By the burning of a structure known as the "New England Institute Building," on June 21, at Boston, Mass., a number of mechanics lost their lives.

The fire spread through the building with such rapidity that the workmen were unable to escape from the second story in time to save their lives.

The building was erected as a permanent structure wherein to hold annual exhibits by the New England Manufacturers' and Mechanics' Institute, but financial embarrassments occurred, and the building was sold to the Metropolitan Railroad Company, who occupied it as a repair shop.

The flimsy construction of the building cannot be too strongly condemned, and should be taken as a warning in regard to future exhibitions.

Had the fire occurred during an exhibition, when thousands of visitors were packed in the building, as often has been the case, the result would have been horrible.

Exhibition buildings in other cities are no better constructed, in regard to fire.

At the Novelties Exhibition last Fall, in Philadelphia, the building resembled a vast tinder box crowded with combustibles, and a fire once under headway, would have caused great loss of life, especially to people who chanced to be in the galleries.

An exposition is always exposed to the risk of fire, and an incipent blaze in Wannamaker's exhibit would have led to disastrous results, but for its being promptly discovered.

The American Institute building in New York city is no better constructed to resist fire, than was the structure recently burned in Boston.

Better construction is demanded for exhibition buildings, and the recent lesson should not pass unheeded.

The *Baltimore Manufacturers Record* urges that prison convicts in the South be employed upon the public roads. The idea is a sound one. Wagon roads in the South are generally bad in the winter, and every convict could profitably be employed upon their improvement. The only objection to the plan is that it does not allow a ring of favored contractors to grow rich out of prison labor. The plan would be in the interest of the whole people, and would not interfere with free labor.

The *Mechanical World* describes an eccentric made by Messrs. Bray & Heald, of Leeds, for which some advantages are claimed. The strap is turned **V**-shaped to fit the eccentric. The latter is made in two sections, one only of which is keyed to the shaft. The other fits the shaft, but is not keyed. The two sections are held sideways to the strap by a bolt passing through them. A distance piece on this bolt prevents the parts being drawn too tightly against the strap, which it will be understood may be solid. When it is desirable to take up lost motion this distance piece is reduced in thickness. The hollow space between the two parts of the eccentric is filled with waste, felt or other material suitable to retain oil, and feed it out to the bearing surfaces as required.

Irregularity in the Contraction of Duplicate Castings.

(PROCEEDINGS AMERICAN SOCIETY MECHANICAL ENGINEERS.)

In further discussion of the above named subject Thomas D. West submitted the following:

From a study of Prof. Sweet's comments upon the irregularity of contraction with his flange pipes, I cannot fully agree with the theory he advances for the cause of same. As far as I can judge from the remarks presented in his discussion, the trouble would seem to me to be greatly due to the variation which existed in the soundness of the castings, which he calls attention to as follows: "As a second peculiarity we noticed that about one-half were usually sound and half unusually poor." Under such a state of affairs there could not exist a uniformity in contraction, let the metal be ever so uniform in mixture. The points called out by Prof. Sweet's discussion are all good and have their effect to some degree, but such a difference as he states existed in the contraction of the flange pipes I feel was mostly caused by the difference in the soundness of the metal in the castings which he cites.

Upright shafts should be avoided whenever possible. If, however, a perpendicular shaft must be used, make the step box to stand upon, and form a part of, a ball-and-socket joint.

If, in addition to the above, the step box can be made adjustable by means of set screws, and fitted with excellent oiling facilities, then the upright shaft will do its work without cutting itself or the step it rests upon.

A piece of sheet Russia iron, or a few filings from good iron placed between pieces of iron to be welded, will generally cause the most obstinate pieces to "stick."

Patterns for Screws.

BY F. W. BARROWS.

In Figs. 34 and 35 we have two forms of thread which may be moulded without cores. Fig. 34 shows a long nut *a*, into which the screw *b* fits. The thread in the nut is made by a core-box, which is of the same length as nut, and has the thread cut on the inside. The thread on *b* is worked on the pattern.

Let us first turn up the pattern for nut straight and of the largest diameter of thread on the outside. This thread is formed only to keep the thickness of the casting uniform, and also to make it weigh less. You must be particular to keep the size uniform for the whole length of thread. Now, to lay out the thread on outside of pattern. If it is not over 4" in diameter, I should take a piece of hard cardboard, and, having straightened one edge, put this to one of the joints in pattern, then roll the cardboard lightly on the surface; when you get around pattern mark the paper where it meets the edge first laid on. Take off the cardboard, make a pencil line across one side at right angles with the straight edge. Make another line parallel with straight edge, at a distance therefrom equal to circumference of pattern, as has already been located by the mark we made when the cardboard was rolled on pattern.

On this parallel line set off the pitch measured from the line at right angles with straight edge, draw a straight line through this point and through the right angle formed by the straight edge and the pencil line; cut the board exactly on this line; draw another line parallel with this new edge, and distant therefrom once the pitch. Now, roll the pasteboard once more around the pattern, making the screw right or left-hand, as desired, and where the edge cut to pitch line crosses the straight edge, see that it exactly coincides with the pencil line which is parallel to pitch line. The cardboard should overlap far enough to glue the two edges together, then we have a cylinder of pasteboard which fits the pattern, and will slide from one end to the other, and which has one end cut to the line of thread. With this templet we can easily lay out the thread on pattern. It is best to space off the pitch on joints, and then make the spiral, drawn by the help of the templet, pass through these points. This will check any tendency of the thread becoming uneven, as might be the case if we trusted to the templet alone.

After you have made one line space off the distance shown at *d e*, Fig. 34, and then draw another line through these points parallel to the first line.

If your pattern is too large for a templet of this kind, you may space it off at the joint on each side, then make the templet to reach half-way around, or you may divide it up still more, as we did the pattern for chain drum, using a templet, as we did for that pattern.

Now, if you will find a gauge which will fit the line *d c e*, you may work out the space between the parallel spiral lines, and then it will be easy to round off the corners left at *d* and *e*. Make a block for sandpapering reaching across one space and a little beyond the center line of thread on each side. You can put the pattern in the lathe and finish the sandpapering, running the lathe on a slow speed.

For the core-box we will get out the stuff in four or six sections, according to size of pattern, because we should have trouble in working a half-box. Joint the sections together, putting the two or three pieces which form each half of the box together by means of pieces screwed on across the joints. You must be careful to get the four or six parts of the box all equal, as we shall make the joints answer the same purpose as the parallel lines on surface of pattern for chain drum.

You must first work your core-box straight through, being careful to get it round and of the diameter of nut at point of thread at *f*, Fig. 34. Then make a templet, as we did for outside, reaching across one section of core-box, being particular about the pitch, making it just the same pitch as templet for outside. Divide the pitch into as many parts as you have divided core-box; and, after squaring off one end of the box, lay out the first turn of thread, as has already been explained, taking care that the thread shall start in the same place as on the outside of pattern. Then you may draw two parallel lines, regulating their distance apart by the intersection of the circle which bound the groove inside of nut, with the straight lines which marks the present surface of core-box.

In working this groove you will be well repaid for using extra care when you come to sandpaper, for if it is a small box, I think you will find it the worst job of sandpapering you ever had.

Make the diameter of prints half-way between the largest and smallest diameter of thread; this makes the casting with the least fin possible at the ends.

For the inner screw, lay out and work in the same way that you made the thread on outside nut. The diameter of this screw will, of course, be governed by the clearance deemed necessary. The pitch, of course, will be the same as the pitch of core-box.

For a thread like that shown in Fig. 35, I think the quickest way is to put on the thread as we did the core-print on chain-drum.

It may be worked in the same way, too, being careful to keep it up to size, and after it is

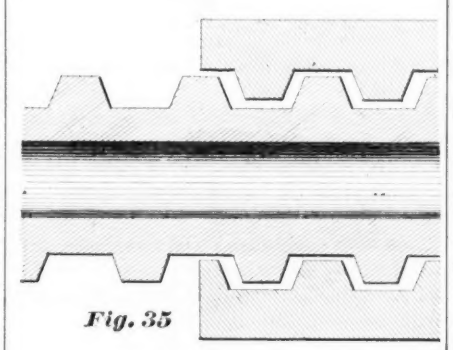


Fig. 35

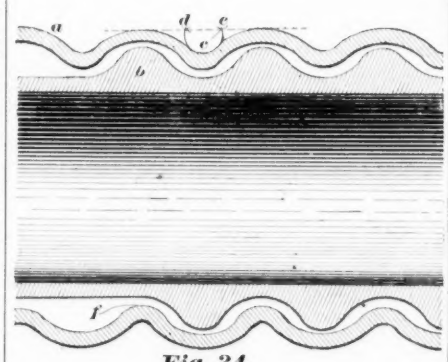


Fig. 34

PATTERNS FOR SCREWS.

all on put the pattern in the lathe, make a block to fit the space between two adjacent threads, and reaching across the tops of thread, then by running the lathe at a slow speed you can finish up the job in good shape.

The nut shown is sometimes made in halves, and held together by means of a wrought-iron band, shrunk on, or it may be made by a core; in either case, I should make the thread in sections, and fasten on the surface of pattern or core-box.

In all these core boxes having a thread on their surface, you must be particular to make a good match at the parting. This is best done by using good dowels, and then putting the sections on either side of the joint together in your vise, and finishing them with sandpaper while in this position.

Another thing you must be particular about in making screws and nuts which are to fit together, is the pitch. It won't do to make the screw with a pitch of ten threads to the foot and the nut with nine and three-quarters or ten and one-half.

It is estimated that 300,000 horse-power can be realized at Lockport, N. Y., by the Niagara River canal project.

Hydraulic Forging.

BY J. RICHARDS.

It is proposed in the following article to present some views opposed to the present tendency of forging processes in the hydraulic system.

It is generally unsafe to construct any innovation in machine processes that seem to be gradually gaining ground, but it is still more unsafe to adopt and preserve methods that violate what may be called "Mechanical Principles." At any rate it can do no harm to review both sides of the problem, and I venture to assume that the employment of hydraulic force in forging is open to grave objections when compared with other means of transmitting and applying power for this particular purpose.

The objections to hydraulic machinery may be summarized as follows:

(1.) It is wasteful of power. In all machinery of the kind when supplementary pistons, intensifiers or independent accumulators are not employed, the power expended is as the movement of the dies and not as the work performed, and as the working range rarely exceeds one-fourth there is a proportionate loss of power.

When the auxilary devices named are employed it involves not only complicated and elaborate controlling motors, but the whole plant exceeds in extent and cost what would be required to apply the same force in other and more economical ways.

Hydraulic cylinders, intensifiers, accumulators, compressing pumps and motive power for a plant, taken together, compare very unfavorably with machinery to produce an equivalent result by the impact of a moving mass.

(2). It is simply a means of transmitting power and a wasteful one, when applied to producing reciprocating motion when rapid or frequent action is desired. In general practice its value has appeared mainly in respect to certain conditions, namely: (a) when power has to be conveyed to long distances; (b) in the segregation of power for distribution in varying quantities; (c) to produce slow rectilinear motion against resistance that is tolerably uniform; (d) to secure "abutment" against return movement.

Forging does not come under any of these heads. It calls for continuous change of range and intensity, both of which functions are wanting in the hydraulic system.

(3.) It lacks rapidity of action. The efficiency, or, as we may say, the expense of forging depends in a great measure upon the "celerity" of action. The time required to shape material into any form is in most cases a measure of the expense of heating. Not only this, the quality of forgings depends upon the temperature at which they are treated, and as at best the conditions are continually varying as cooling goes on, it becomes important to do as much as possible while the material is hot. This means rapid motion, which hydraulic machinery is not capable of. The measure of time is as the relative area of the valves and piston, and area of the latter is limited by pressure. This matter of valve area is an important factor in the case, and hydraulic engineers will watch with some interest the performance of Mr. Davey's 4,000-ton press to operate at a maximum pressure of 4,500 lbs. to an inch, recently constructed for Messrs. Cammell & Co., of Sheffield, England.

(4.) Economically as first cost, area occupied, expense of maintainance, skill and attendance required, power utilized, and so on, the hydraulic system, as before said, compares most unfavorably with the impact system. I think that on these points there can be no difference of opinion unless it be with respect to cases where a number of machines are operated from one source of power.

Supposing these propositions to be tenable, the question may well be asked, why then has the hydraulic method been adopted?

I will attempt an answer to this question, under subdivided heads, so that erroneous propositions, if any, may be more readily detected.

(1.) The strains involved in modern forging processes have surpassed the possible strength of moving bearings, that is, direct action by means of cams, toggles, screws, and so on, is not possible, or is at least considered so. A piece of 4,000 tons, for example, could not now be "taken up" in any kind of moving joint. Struts or connections to endure direct lineal stress offer no trouble. They are required in any case, in hydraulic as well as other machinery, but the avoidance of moving joints and angular strains are the difficulties that have recommended hydraulic apparatus.

(2.) The variation of range or adjustment is also a difficulty in all direct acting machinery for forging purposes. The field of known mechanism furnishes various expedients to provide varied range in reciprocating motion, but, if we except the wedge, none of which could endure 4,000 tons.

(3.) The steam hammer has remained, with but few exceptions, where Nasmyth and his partners left it; a component of momentum and expansive steam pressure, adapted in every particular to the lighter class of forgings where sudden blows are suitable.

It has, however, been found impossible to increase such hammers to correspond with the demands of modern forging; or, rather, it has been found impossible to slow their action and increase their intensity to meet the requirements of forging large masses.

(4.) In abandoning the steam driven tup there has been a reaction to the other extreme, to hydraulics, and the middle ground has not, I think, been explored. We have on one side the percussion steam hammer, on the other the tardy hydraulic system.

Between these two I venture to submit lies a better system; that of increasing the mass of the ram until the time and intensity meet the requirements.

An example of this method exists at Crew, in England, where the well-known engineer, Mr. Ramsbottom, twenty years ago, constructed a hammer in which steam action was almost eliminated. Two immense rams were mounted on truck wheels, and connected by diagonal links with a steam piston beneath. These rams were given a range in accordance with the blow required, and as their weight and action were equal, one neutralized the other, and there was no shock or jar communicated to the foundations or other parts, at least none that caused wear or danger.

I am well aware that the construction of the common steam hammer will not admit of the application of this principle, nor is it necessary it should.

Vertical action is not necessary, or even desirable. Horizontal movement in many respects best meets the conditions of forging heavy pieces.

This subject of vertical handling and vertical heating has received very careful attention from one of our best steel makers, Mr. Hainesworth, of Pittsburg, who has demonstrated its value and importance and patented his furnaces and processes in this country and in Europe.

A horizontal movement of two equal masses giving uniform effect on each side, and thus neutralizing shock, the time and intensity governed by the weight of the masses I venture to submit comes nearest to filling the conditions required in forging heavy pieces, while the first cost of such a plant would not exceed one-half required to perform an equal duty on the hydraulic method.

Inclined Plane Elevator.

In many buildings an elevator to connect cellar, or sub-cellar, and sidewalk, would be a great convenience. In some cases this is not practicable, owing to hatchways not being vertically over each other.

An "inclined plane elevator" has recently been built in a building on Fulton street, New York city, and this elevator surmounts the obstacle encountered by the ordinary elevator.

Two timbers are laid parallel with each other, and extend from sub-cellar sidewalk on angle of about 45 degrees.

A track is laid upon these timbers and a car is placed thereon, which is so built that its floor is level.

New Designs of Steam Pumps.

The tank pump, illustrated on this page, is designed for elevating water when the elevation is small, and therefore admits of a steam cylinder much smaller in diameter than is used on regular style of pumps. There pumps are largely used for railway water stations, gas-works, distilleries, tanneries, etc. The water valves and passages are sufficiently large for the passage of a large quantity of water so as to admit of a high piston speed. The steam valve gear is noiseless, and the stroke adjustable, even while running.

The double plunger pump is from entirely new patterns. It is adapted for the heavy steam pressure used on western rivers and for pumping impure water. The plungers being outside packed any leak will be at once noticed. The plungers do not touch the cylinder, consequently no reboring is necessary. There are but few joints to the pump cylinder. The whole design is as simple as possible. These pumps are made by the Dean Steam Pump Works, Indianapolis, Ind.

LETTERS FROM PRACTICAL MEN.

The Feed-Water Question.

Editor American Machinist:

In your issue of June 12, Mr. John Coffin quotes from Rankine: "If no heat be given to steam from the outside while expanding, the curve of expansion will fall below the curve of saturation;" and then he adds: "That is, that some of the steam will condense in expanding, for to fall below the saturation curve some of the steam must condense."

He contradicts this well-known theory. Referring to a case where an engine is cutting off early with saturated steam and water of condensation in the cylinder, he says: "As expansion goes on this water is re-evaporated, and at the end of the stroke we have a cylinder full of saturated steam." On another page he shows that in expanding from 80 lbs. to 20 lbs., absolute pressure, he loses 26 heat units, that is, 26 heat units disappear while the steam is expanding; and these he argues go to superheat the steam.

I would like to ask Mr. Coffin where the energy came from to move the piston while expanding, if not from these 26 heat units? As I understand it, the heat which disappears is the equivalent of work done. Or, stated in another form, when work is performed the steam delivers up a certain amount of heat for the performance of this work and the temperature of the steam is thereby diminished.

By making these 26 heat units superheat the steam, Mr. Coffin increases and decreases the temperature of steam at the same time. The same can be said of the case where he started with saturated steam and water in his cylinder and after expansion had saturated steam only. In cutting off very early this might have been the case, as the heat from the hot cylinder sides may have re-evaporated the condensed steam. But in this case heat was added from the outside—which thoroughly agrees with Rankine when he says: "If no heat be given to steam from the outside," etc.

If water is under no other pressure than that of the atmosphere I do not see how it can be heated, either by exhaust steam or any other method, above 212° Fahr. without vaporizing, thus causing back pressure.

J. J. FLATHER.

Ansonia, Ct.

Corrections in "Patterns for Screws."

Editor American Machinist:

In my article on "Patterns for Screws," published June 26, I find that I have made a mistake. I presume a good many readers of your paper have noticed it, and if you will correct it I shall be much pleased.

At the bottom of second column, in the paragraph which begins, "Now, to finish the cores for ends of spiral, you take out one of the loose pieces (with spiral face) and make a core reaching to end of box, as shown by lines *d e f*."

This is wrong. The core should not reach the end of box, but should be one-half the pitch shorter. So, instead of having one piece of parallel thickness in core-box, I should have said, make two loose pieces, the second one-half the thickness of the first; or, one having a thickness equal to one-half the pitch—the other the full pitch, as from *b* to *c*. Then make the first core with the second piece in the box; this will make it one-half the pitch short of the broken line *e*, Fig. 33. This is, of course, the leng'h needed.

Again, at the top of second column you make me say: "This other half must now have," etc. What I intended to say was: "This other half must 'not' have," etc.

FRANK W. BARROWS.

Concerning that "Air Trap."

Editor American Machinist:

It appears to me that Prof. Sweet's explanation of the air trap, in the MACHINIST of June 12, leaves us with an another mystery on our hands quite as difficult to solve as the first.

If the pipe *d* had a slight dip towards the cistern, or an elbow, or turn downward in the cistern, it would be easy to understand how the air could be locked in and conditions made that would prevent the filling of the pipe with water. But, as shown in his sketch, what prevents the air from bubbling up through the water and escaping? In ordinary cases where the pipe would be at least ½" and more likely 1" inside diameter, I can see no reason why the laws of gravity should not prevail. Will Prof. Sweet please explain his explanation.

F. B. RICE.

Experiment to Settle a Friction Question.

Editor American Machinist:

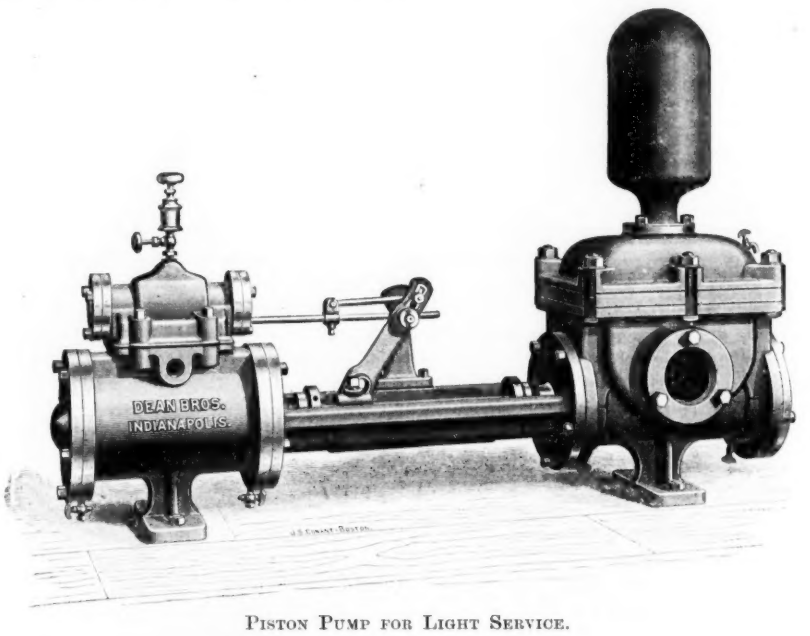
Doubtless, some dozens of people are ready to reply to U. Short (p. 6, AMERICAN MACHINIST of June 19th), each commencing, "Why, of course." But might one suggest to him that a very simple experiment will settle the first and principal query?

A piece of shafting secured vertically; a collar to supply the place of stand *B* (see his engraving); two pulleys, each anywhere from 12" to 30" diameter; a cord attached to the rim of the lower pulley, passing around it and off horizontally over a sheave or something "rigged up" for the purpose; another cord attached to the rim of the upper pulley, so that it can be carried off horizontally and made fast. The upper pulley will replace collar *C*. The pulley rims must, of course, not touch. Detach the cord from the upper pulley; put some weights upon it, as symetrically as possible; see how much weight, attached to cord of lower pulley, will turn the whole affair. Now hold the upper pulley fast by its cord, and see how much weight is necessary to turn the lower pulley.

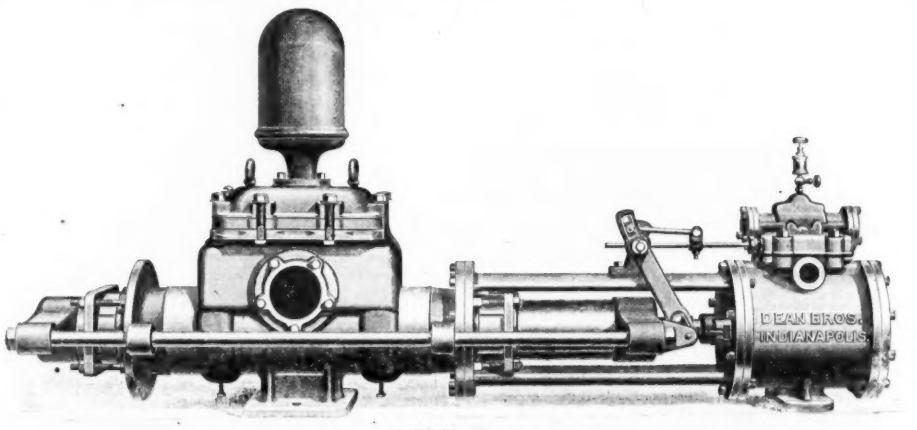
But, in U. Short's view of the case, ought it to require any force to hold the upper pulley fast? Is it not evident that ——well, try it.

A. B. COUCH.

PHILADELPHIA.



PISTON PUMP FOR LIGHT SERVICE.



DOUBLE PLUNGER PUMP FOR HEAVY PUMPING,

Removing Tight Pulleys.

BY JAMES F. HOBART.

To quickly remove a pulley which fits tight upon a rusty shaft, is a problem which often turns up in a mill, and which often gives the mechanic a hard fight before it is solved.

Every mill should possess clamps and a screw for pressing off pulleys. A pair of iron bars, 10 to 12 feet long, having a row of holes in each rod, and being fitted with a pair of stout crossbars, will form a good rig for attaching a common jack screw to the work.

Sometimes the above rig can be extemporized. Sometimes a stout chain or cable can be hooked to the pulley arms, passed over jack screw, and a strain obtained in that way.

A strain upon a pulley, even if much lighter than is needed to start the pulley off, will, if supplemented by the vigorous use of sledge hammer or ram, start pulleys, which either strain, or blows alone would fail to move.

Before breaking obstinate pulleys it is well to try a little fire. If safety of the mill will allow it, rig up a blaze of charcoal or light wood just under the hub of the pulley. If this seems dangerous, make a fire of coal, and urge it along with a pair of bellows or by creating a draught by other means.

On shafts of 4" or more diameter the heating process proves very effective, the large circumference of the shaft allowing a greater amount of expansion comparatively than upon small shafts, 2" or less in diameter.

A jet of gas from a ½" pipe will soon make an effective impression upon a big pulley hub, and the job may be hastened by keeping the hub free from lampblack, which is apt to form quickly owing to only partial consumption of the gas which escapes from the pipe.

A liberal wetting with kerosene oil, if applied frequently for one or two weeks, will help largely in starting an obstinate pulley, but to apply a dose of kerosene oil, with the belief that it will penetrate almost instantly between hub and shaft, that idea is all nonsense. The same thing happens when this oil is poured freely over the outside of a bolt on which a nut is "stuck" by a rust joint of many years' duration. Coal oil may be poured on that bolt for weeks without "starting" one particle of rust.

Rams are more effective than sledges for driving off pulleys or gears, and may be extemporized quickly by hanging pieces of shafting, by ropes or chains, in such position that end blows may be delivered on hub of pulley or gear.

One, two, or even three rams, as above described, if their swing be timed so they all strike at once, form a powerful battery, to which most pulleys will yield or break.

In case of a heavy pulley or gear on a short or light shaft, the shaft has been suspended and swung against a timber resting against a brick wall. This form of ram proved very effective, but was destructive to the shaft.

The trick has also been done of hoisting gear and shaft to as great a height as convenient, and letting it drop endwise upon some solid foundation. Such extreme cases are rarely met with, and pulleys which will not yield to a combination of pulling, ramming and heating had better be broken from the shaft.

From two to a dozen ¾" holes, drilled in hub nearly to the shaft, may be filled with shims and wedges, exactly as for breaking stone.

A steady application of a light hand-hammer will split the largest hub. In this case care must be taken that the wedges stand in line, that they do not "bottom," and that they fit the shims nicely.

When wedges are in place, drive them carefully and evenly. Strike each one lightly, and take care that they all give back about the same sound when struck. Having one or two wedges tight, while the rest are partly loose, will not ensure a split.

In such cases the tight wedges get driven until they break or cripple, while the loose wedges are of no use whatever.

Sometimes hubs are broken by chipping a channel with a cape chisel, and then driving a blunt, heavy chisel into the channel, with a sledge.

In this case the part of the chisel which enters the channel should be made slightly tapering and a little thicker than the channel. Grind the end of chisel to an angle of 90 degrees, lay hub on a solid support, and proceed to caulk the bottom of channel with this tool, driven by a sledge hammer.

A hub can also be invariably broken by repeatedly striking it with a hammer. It probably would not be a profitable job, but it would be a sure one, as the steady jarring would break the bond which unites the cast-iron particles, and the hub would eventually fall apart, although the job might take a week or two to do in this manner.

Philadelphia, Pa., and Rochester, N. Y., have what is believed to be the cheapest electric lights in the United States. The price per night is 45 cents at Rochester, 48 to 59 cents at Philadelphia. The average charge through the States for 200 candle-power lamps will approximate 60 cents per night.

Master Mechanics Convention Notes.

As is customary every year at 12 o'clock the first day of the convention, the association devoted an hour to topical discussions.

The first question was by Mr. Stevens: "What good are self-dumping ash-pans?"

Mr. G. W. Stevens (Lake Shore and Michigan Southern R. R.):

Mr. Chairman—What prompted this question was the fact that during the last year and a-half the officers of my company, as well as myself, have been from time to time called upon to adopt a self-dumping ash-pan, and the parties urging this adoption have been from time to time fortified with a circular letter from the officers of different railroads, from which letters I will read a few extracts, without mentioning the writer's name. Here is one that states that with the use of slacked coal and the patent ash-pan there has been a saving of $6,489.47. Now, the question arises, how much is there in the ash-pan, and how much in the slacked coal? Here is another letter: It says that by the use of self-dumping ash-pans there has been a saving of about 15 lbs. of coal on each locomotive mile run, amounting to some 450 tons of coal for each 1,000 miles run. As there are some gentlemen here who are connected with railroads upon which pans of that character are used, I think that, if the saving can be shown to be as much as that, it is certainly information that ought to be brought forward. If it cannot be shown, the custom of giving testimonial or recommendatory letters for publication ought to be stopped.

In answer to a question Mr. Stevens said the ash-pan was believed to have effected that saving, which Mr. Briggs thought a very remarkable thing.

Mr. M. Lamar Collier (Western & Atlantic R. R.):

Mr. Chairman.—About six months ago I put one of those ash-pans on a locomotive 17"x24" a ten-wheeler, on the Western and Atlantic Railroad, my action being based altogether upon the assertions contained in, or rather upon, the letters read by my friend Mr. Stevens. The ash-pan was given a fair trial; there is no question about that, and we fail to see that there is any saving attached to its use in any way. It is a very good ash-pan as far as the requirements of ash-pans go, but as to saving anything we have failed thus far to discover that it does so. I know that we have engines of the same class as the one referred to, but with an ordinary ash-pan, that burn less coal than the ten-wheeler spoken of does. But whether the ash-pan is the prime feature in the failure of the ten-wheeler or not, I cannot say; I believe, however, that it is.

Mr. Jacob Johann (Centreville, Iowa).—I have not yet seen a self-dumping ash-pan which has worked more economically as regards the consumption of fuel than any other ash-pan works. I have always regarded it as a matter of convenience in cleaning out your ash-pan. And then again it has always appeared to me that while a self-dumping ash-pan might have some good points—such as convenience in cleaning it out—the objections to it were so much greater that, up to the present time, I have not had the courage to even put one on to try. And while we are speaking upon this subject of self-dumping ash-pans, I am reminded that while on my trip here from Chicago I saw an innumerable quantity of fires, ties burning between the rails; this struck me as very remarkable, and I couldn't think where so many fires came from. It is barely possible that on those roads they are experimenting with self-dumping ash-pans. For, although I know the country is dry, still where I am we have not had any such fires as those referred to; and I do not think any railroad should have them. It would set me wild if we had them on our road. There was not a mile over which I passed where there were not from two to three and sometimes four of these fires blazing up between the rails. Whether they were caused by self-dumping ash-pans or not I am not prepared to say. I did, however, ask the brakeman what the trouble was with their ash-pans. He did not know; he said the country was very dry, and that fires were easily ignited. Of course that is one of the things we should provide against, when the country is very dry, to prevent these fires. It may be very possible that these railroads over which I passed are experimenting in self-dumping ash-pans; that is my opinion.

Mr. Collier—In the self-dumping ash pan the fire is dropped from the grate into the ash-pan and allowed to remain there for half a mile until the coke or such stuff dies out; then they just reverse the bar, and it drops out. We all know that with the ordinary ash-pan, the dumping of fire or the cleaning out of fire while running throws the fire on to both sides of the road tremendously. This new ash-pan will overcome that. The statements contained in the remarks that I made a few moments ago were used simply to show that there is no saving of coal in the self-dumping ash-pan. I repeat that as far as the quirements of the ash-pan are concerned, of dumping the fire at your leisure, it is a good thing. You can simply reverse this bar, and the fire falls down—dead coke or ashes—whatever it may be. We have several in use on our railway; and while we do not claim that they effect much saving in coal, we do think that they effect a saving in another way—that is, they save handling our ashes at the round-house. They dump it on the road; and if the engineer or driver exercises a little care or judgment in dumping his fires, there will be no danger. In cases where there have been fires, it is because the engineers have been careless and dumped the fire too soon. The only object we have in using self-dumping ash-pans is, that with us, in the winter time when our trains are running in snow storms, the ash pan is apt to get filled up with snow, and it melts and forms ice there, and frequently it affects the bar so that it cannot be dumped, The consequence is that the men have to go underneath in the snow, and scrape the ashes out, particularly in long runs. But by shaking the bar frequently, not very much at a time, the ashes are dumped into the pan; then, before it freezes, they are tipped out, and it keeps the ash-pans clear all the time. We frequently have runs of 180 miles without tipping the ash-pans, if we have these self-dumping ash-pans. Without them, in heavy storms, we are frequently delayed. We have had to set trains off on this account. The only way that saving in coal can be effected by the use of self-dumping pans is that possibly, by the men keeping their fires clean, they burn less coal, the air comes through more readily, and it don't require so strong a draft to burn the coal. No man will lie down in the snow, and clean out his ash-pan.

He will let it run as long as possible before he tries to do it. The result is that it gets all stuck up and frozen.

Mr. J. S. McCrum (Missouri River, Fort Scott and Gulf)—For my part, I fail to see wherein the self-dumping ash-pan could be any possible advantage in the saving of coal. In the next place, it occurs to me that in some sections of the country, at least in the West, over our Western prairies, they would be a very unsafe thing to use. It is entirely possible that the fire that would be shaken into the ash-pan from the grates would all be extinguished before it was dumped, or it might not be. This matter was presented to me two or three years ago and I didn't think it consistent for us to undertake to use them. Possibly, where they have stone ballasts and that kind of material, you might dump your pan without danger; but I do not believe you could in our Western country. In reference to the question of pans freezing up, etc., in the winter time, I can see, perhaps, where the self-dumping pan might possess some advantages over the ordinary pan. But it occurs to me that the disadvantages are more than the advantages; that is my view of it.

Mr. Briggs—We have discussed smoke-stacks, extended boilers, fire-boxes, and now we have come down to the ash pan, and it seems to me about time to "dump the ash-pan." I have never had any trouble in running on a snowy road without a self-dumping ash-pan. In the way of saving coal, I never saw any improvement with it; and it seems to me th advantage would be greater without an ash-pan than it would be with. I move, now, that we dump the ash-pan and drop the question.

Mr. Stevens—I wish to offer this resolution:

Resolved, That this association deprecates the giving of testimonial or recommendatory letters for publication, and enjoins all to restrict matters of this nature to letters of inquiry.

Mr. Collier—I think the remarks that led to the discussion of this question were eminently proper. An invention of this kind goes out as indorsed by master mechanics here and there, while the thing is a failure. I am opposed to anything of that kind. Men should be very careful when they indorse these things as to whether they possess any real merit or not.

Mr. Stevens—The sum and substance of it all is that, if you want to know about an invention, inquire for it. This is an adoption of the Pennsylvania road. I never saw a recommendation of the Pennsylvania road, but they frequently give their opinion, or their experience, if you write for it. That is all that is embodied in this.

Mr. Johann—Mr. Stevens' resolution is very good, but I think we can put much more force upon it if each member of the association will appoint himself a committee of one and say that he won't give any recommendation; that is what I have been doing for the last ten or fifteen years. I see no impropriety in passing the resolution. I think this matter of sending letters all over the country is all nonsense, and does not amount to anything. I do not pay any attention to them. I say that I want to eat the pudding myself.

On the question being put, Mr. Stevens' motion was declared carried.

Secretary Setchel—Question No. 2 is, "Is the present form of quadrant satisfactory as a means of regulating the cut-off?"

Mr. Angus Sinclair (*National Car Builder*, 187 Dearborn street, Chicago)—Mr. President, this subject was suggested to me by many experiments which I have lately been making with the indicator. I found that an engine, say, that would haul a train cutting-off at six inches, with a slight increase of resistance, the amount of steam being admitted was too little cutting at six inches, with the throttle wide open. They would have to drop down to nine inches, and at that the steam admitted was too great, and consequently it had to be throttled. To a great extent, a locomotive may be made to approximate the performance of an automatic engine, if the steam is admitted to the cylinders unthrottled. But if it has to be throttled all the time, and badly throttled, as it has to be in a case of that sort, the locomotive works under the disadvantage of a badly throttled engine. And I found, in figuring up the indicator cards under the two conditions, that there would be from 15 to 20 per cent. more steam used to do the same amount of work when the engine was throttled than would be used if the quadrant could be regulated to admit the steam unthrottled. That is to say, instead of cutting-off at nine inches, you could drop down to seven and a half. If you could divide it, there would be a very considerable advantage in the saving of steam. In some cases a screw has been applied, as a means of regulating the cut-off. That is, the engine is reversed by screw instead of the notched quadrant; and I know that considerable advantage has been derived therefrom. Those who are familiar with the steam reverse are also aware that considerable advantage has been derived from it, from the fact that the admission of the cut-off could be regulated much finer than by the quadrant. If anything could be done in even a simpler or cheaper way than the steam reverse, I think it would be desirable, and would be an improvement to American locomotives, if it were adopted.

In opening the topical discussion at noon of the second day, the president asked if any member had a question to present.

Mr. W. Woodcock—I have one: Is it desirable to continue the use of steel for driving axles? One of our members stated that he had used steel for some time, but has gone back to the use of iron, because he found that the steel broke, or that he got poorer results in the use of steel than from wrought iron. That has not been my experience.

Mr. Lauder—My observation and experience, since homogeneous steel first came into use for axles, pistons, crank pins, piston-rods and the like, has been of such a character that it has given me very decided views; and those views are that steel, no matter of what make it is, is an unsuitable material for those purposes. So firmly do I hold to that view that I have taken engines that were less than three years old and removed from them the steel axles, crank-pins and piston-rods, and substituted iron, notwithstanding everything was apparently sound and all right. I did not dare to run those things any longer on fast passenger work for fear of breakage. I did that at quite a large expense, simply to make the thing safe beyond question. Perhaps others may have had a different experience in the matter from what I have had, but I have had very poor results from steel. I would say, however, that I have not been in the habit of using Krupp's steel for those purposes. I have used the "open-hearth" steel. Possibly Krupp's Bessemer steel might give some different results. Some roads are using steel for those purposes. I believe that in some instances where steel has given me bad results, it was owing to faulty designs. It is probably well known that sharp corners in steel invite disaster; and I have known of instances where axles were put on with the wheel fit somewhat smaller than the journal, and turned up to square corners. That, of course, we would expect to break sooner or later with any material; but I think that iron, under those circumstances, would be very much more durable and safe than steel. We have broken on our road quite a number of steel axles, and in every instance, or in at least some instances, they were cracked entirely around the axles, having only a spot in the center to hold them. I have also seen that same thing with iron. In those instances there was a square corner, the wheel-fit being turned smaller than the journal, and turned down to a square corner. With good homogeneous steel, and all sharp differences in the square corner avoided, I presume that steel would give good results, but my experience has been entirely in the other direction. As far as the wearing of the material goes, I prefer iron. Iron glosses over and becomes smooth with very little wear very much better than steel. Whether it is due to the fact that iron gets better lubrication or not, I am not prepared say. Possibly, the steel being a denser metal, the lubrication is more imperfect; the cells in iron being larger, it being fibrous material, and there being in it little seams, the lubricating material is allowed to go into these little cells and lie there, and it assists lubrication. That may account, in some measure, for the difficulty of running steel without heating. I have had crank-pins that were rather small for the service required of them, which would run hot; they would get about so hot and keep there. I have taken them out, and put in good hammered iron, and have had no further trouble from heating. I have had that happen several times. Why it is I am not prepared to say, unless it is because the iron lubricated better than the steel. Steel will break in curious ways. I look upon it as an uncertain material, where the part is subjected to changes of strain, as in the case of a piston rod. I have had piston rods break within a year, in the cross-heads, in the fit, half way between the end of the key-way and the shoulder. Now, the piston rod ought to have broken at the shoulder or through the key-way. The sewere the weakest parts, and you would naturally expect the rod to break at the weakest part. Instead of that, it took the eratic course of breaking just about half way between the two weak points, and in as clear metal as I ever saw, without any cracking. I have had two of those cases within a year, when, by all mechanical laws, the rod should have broken at the shoulder.

Mr. Woodcock—My object in speaking was more in reference to the driving axles. My experience has been just the reverse of Mr. Lauder's. We have had several engines in which we have had trouble with hot driving boxes, and upon examination of the journal I found that they were composed of iron that had not been properly welded, and the longitudinal seams were completely filled with seams. My theory is that the boxes became a little warm, and that the expansion of the iron caused the edges to appear and scrape the brass off in the oil box, as we found quantities of brass there. With a homogenous steel axle we did not have that difficulty at all. If you could get a first-class quality of iron, thoroughly welded solid, we might get very good results, but this is one of the difficulties with which we have to contend. With steel we are almost sure of getting a good homogeneous metal.

Mr. McCrum—My experience with steel and iron axles has been very similar to Mr. Woodcock's. Some years ago I used iron axles altogether, and I found a great deal of difficulty in getting them solid. Four or five years ago I commenced to use steel driving axles. I have had no trouble with their breaking. We run them quite successfully, so far as heating is concerned. If I could get a good solid iron axle, I believe I should rather chance it than a steel.

Mr. Lauder—I think the breakages of steel are largely due to faulty design. I think that this turning the wheel-fit below the diameter of the journal, or, in fact, having anything where there could be a sharp corner or mark of any kind, invites disaster in steel more than it would in iron. So that I presume my experience in the use of steel for axles has been brought about by fault in the designing of the axles rather than in the material. Possibly it may be that. I know the designs were bad, because of the presence of these cracks of which I have spoken, but I still think that a good quality of iron is the safest material we have ever had yet.

Mr. McCrum—There is only one-eighth of an inch difference between the diameter of the wheel-fit and the journal in our driving axles, and we avoid making sharp corners.

Mr. Lauder—Wouldn't it be better to put it right in straight without any sharp corners?

Mr. McCrum—I believe it would. I think it would be better to have the journal and the wheel-fit the same diameter. It is only for a matter of convenience in putting in the wheel that it has been made as it has on our road.

Mr. Sinclair—In visiting master mechanics I have been very much struck with the diverse opinions that existed in relation to the use of steel for axles and pins. Go to one place, and the master mechanic would have nothing to do with steel; iron was the best thing in every way; he was satisfied; he had tried both; he was satisfied that steel was no good. Go to another master mechanic, perhaps in the same city, with engines running under very similar conditions as in the first case, and you would find that he was just as much in favor of steel as the other was of iron. In trying to investigate the subject somewhat, I came to the same conclusion as Mr. Lauder, that the objection to steel lay in bad forms. I think that steel is decidedly more reliable material if the form is properly made; but, on the other hand, I think that with a bad form it is not so reliable as iron. There is no road in the country that keeps a better statistical report of its engine mileage than the elevated roads in New York, and I think their experience with steel has been somewhat edifying and worthy of our attention. It is necessary for them to keep down their weight as much as possible, and consequently every part of their locomotives is just as light as it can safely be made. They tried iron axles first, and the breakages required them to look to steel. It is very undesirable for an axle to break on any road, but especially on an elevated road. The elevated roads tried both steel and iron, and kept a very close record of how they run. The conclusions arrived at were that you sometimes get an iron axle that will run very much longer than a steel one; but, at the same time, it may break with one-fifth of the wear that you can depend on getting out of a steel axle. A steel axle, again, would very rarely break in a given mileage. And they came down to it so closely that they could tell within 10,000 miles or so of when a steel axle would break. They have now decided that a steel axle has a known life, and an iron one has not. They can make an iron axle better than a steel one, but they cannot tell when it will break. Those who have watched iron axles that have run a very long mileage, that have been in use twenty years, will, in many cases, have seen that the tendency of the iron is to form into distinct strands, and your axles will be a series of cracks. I think this is a very objectionable feature for an axle to have, for you never can get the journal to run without additional friction. I think that objection holds good against the regular wearing of any axle. There seems to be nothing in its durability to recommend it for use.

Chas. A. Ball, Brooklyn Elevated Road—I think that Mr. Sinclair is right. Steel is found to break on account of its form. The New York people have got this matter of axles down to a science. They run a steel axle just so many thousand miles, and take it out. But in the case of an iron axle there is no real age to it.

Mr. Setchell—There has been a question that has interested me somewhat. It is as to the proper manner of fitting truck brasses, or liners, as they are sometimes called, in the truck box casting. I have recently fitted up some engines very closely (and I have often done the same thing before), planing the brasses and boxes, planing the jaws of the box groove, making everything accurate, and seeing that the truck would tram just as closely as the drivers themselves. Some of our friends think that that is too tight—that truck-boxes or brasses ought not to be fitted up in that way; that is, that there ought to be room for them to "give and go," as they express it. If the box accidentally gets hot when it is fitted up so tight, it will hug the axle; there is no room for expansion. Then the question would arise, why the wheel is not liable, from the tipping of the brasses, to throw the truck out of tram, so that the wheel will cut the flange on one side or the other? I see that there is force in the argument that if by any means the brass gets to heating it is very liable to hug the journal, unless there is ample room allowed on the side so that it cannot cramp on the journal. I recently had occasion to examine engines on one of our roads, and the foreman told me that they made a practice of putting in their wheels without facing the hub and without planing the boxes; they just put their brasses right on, and that they never had any trouble. I think the appearance of the engines maintained their claim.

Mr. McKenzie—Did you also ask the foreman how much lateral motion they allowed?

Mr. Setchel—I could see for myself without asking; it was not less than half an inch in any of them.

Mr. McKenzie—If the wheel of the engine was in good gauge, and the driver, the center of the engine would certainly carry it straight, while the wheel would be allowed to vibrate laterally across the engine. My experience has been that the nearer complete you get your truck, and the more work you put into it, the better results you get. It is just as necessary to fit up a truck accurately as it is to fit up the driver.

Just before adjournment on Friday the Master Mechanics Convention elected the following officers:

William Woodcock, President, Central R. R. of New Jersey; Jacob Johann, 1st Vice-President, Chicago & Atlantic R. R.; R. H. Briggs, 2d Vice-President, Ches., Ohio & S. W. R. R.; George Richards, Treasurer, Boston & Providence R. R.; J. H. Setchell, Secretary, Brooks' Locomotive Works.

A committee on the revision of the rules of the Association was appointed with Ex-President Barnett as Chairman.

Cost of Running Locomotives.

The statement herewith appended tabulates the cost of running two locomotives, used on the Chicago limited express, by the Hudson River and Eastern Divisions N. Y. C. & H. R. Railroad.

For the following statement we are indebted to Wm. Buchanan, superintendent motive power and rolling stock N. Y. C. & H. R. R. Covering a period of 16 months, the performance of these locomotives may be taken as typical of every-day work, as done upon this railroad:

COST OF RUNNING LOCOMOTIVES.

ENGINE.	No. 503.	No. 238.
Class A, 8-wheel Coupled:		
Size of cylinder	17×24"	17×24"
Diameter of drivers outside of tire.	70"	70"
Months in service	16	16¾
Total mileage	121,620	125,216
Average miles run per month	7,601	7,588 85-100
Number of days in service	428	431
" " idle	61	71
Average miles run each service day	284 16-100	290 52-100
Gallons of oil used	912	812
Cost of oil	$341 11	$324 91
Miles run per gallon	133 36-100	154 20-100
Cost of waste	$67 50	$55 05

No. 503.

LABOR AND MATERIAL.

Class.	Engine.	Tender.	Totals.
Machinist	$705 80	$30 15	$735 95
Blacksmith	75 56	31 90	107 46
Boilermaker	45 99	4 20	50 19
Coppersmith	45 58	.....	45 58
Tinsmith	3 33	.....	3 33
Carpenter	18 95	11 06	30 01
Painter	7 99	7 70	15 69
Material	510 38	116 43	626 81
Totals	$1413 58	$201 44	$1615 02

Average Costs per Mile Run.

Machinist	60-100	.....
Blacksmith	09-100	.....
Boilermaker	04-100	.....
Coppersmith	04-100	.....
Tinsmith	.....	.....
Carpenter	02-100	.....
Painter	01-100	.....
Material	52-100	1 38-100
Oils	28-100	.....
Waste	06-100	34-100. Total, 1.66

No. 238.

LABOR AND MATERIAL.

	Engine.	Tender.	Totals.
Machinist	$796 64	$112 31	$908 95
Blacksmith	100 72	41 45	142 17
Boilermaker	127 92	32 30	160 22
Coppersmith	58 11	.....	58 11
Tinsmith	.....	.....	.....
Carpenter	21 88	15 93	37 81
Painter	18 75	31 25	50 00
Material	469 25	171 42	640 67
Totals	$1593 27	$404 06	$1997 93

Average Costs per Mile Run.

Machinist	73-100	.....
Blacksmith	11-100	.....
Boilermaker	13-100	.....
Coppersmith	05-100	.....
Tinsmith	.....	.....
Carpenter	03-100	.....
Painter	04-100	.....
Material	51-100	1 60-100
Oils	26-100	.....
Waste	04-100	30-100. Total, 1.90.

Average cost of engine, 1 16; tender, 16-100. Average cost of engine, 1.27; tender, .33.

No. 503 cut out once at Poughkeepsie on account of hot box.

These locomotives, Nos. 503 and 238, Class A, were not chosen and especially fitted for the purpose of making a good record, but were taken as they are used in ordinary work.

The oil consumption also shows that 503 did not run as cool as 238, as but 133.36 miles were run per gallon of oil by the former, while the latter made a gallon of oil last while running 154.2 miles.

Some allowance must be made regarding difference in the men who applied the oil; and may be noted that the engine using the most oil also required the largest amount of waste.

The fact can also be deduced that the locomotive using the most oil required the least expenditure of labor and material for repairs, also that the locomotive 503, using most oil, shows a total running expense of 1.66 cents per mile, while No. 238, which economized in oil, cost 1.90 cents per mile.

The Master Car Builders' Association.

The convention of this association, beginning at Niagara Falls, June 8, was the twentieth in number. There was a good attendance, and more than the usual interest in the questions discussed.

The president, B. K. Verbryck, of the Chicago, Rock Island and Pacific Railroad, submitted an address, in which the inception and progress of the association was touched upon, and some of the important work before it referred to, various details of business were attended to, and committees appointed.

The committee on a Standard Freight Car Truck reported that only two roads had built and put in use the truck recommended at the last meeting of the association. These were the Michigan Central and the Chicago, Burlington and Quincy. Each of these roads had sent a pair of trucks to Niagara Falls. So far as known, they had given good satisfaction in service. One of the trucks sent by the Michigan Central had swing bolster, and one a rigid iron bolster. The Chicago, Burlington and Quincy trucks had trussed wooden swing bolsters.

The committee on Standard Appliances for the Safety of Train Men failed to make any report.

The committee on Automatic Freight Car Brakes did little more than put in a plea for funds to continue their work.

It was concluded by the committee on Trap-Doors in the Roofs of Passenger Cars that they were not needed. If a passenger was not held fast in the wreck, he would be able to get out of the many openings in passenger cars; if he was held fast, he could not get out at the trap-door.

The recommendation of the committee on Standard Dead-Blocks was:

1. That the standard height of draw-bars for freight cars, measured perpendicularly from the tops of the rails to the center of the draw-bar, shall not exceed 2 feet 11 inches when the car is empty, nor be less than 2 feet 9 inches when it is loaded.

2. That the height of dead-blocks, measured from the tops of the rails to the center of the blocks, be not less than 3 feet 5 inches when the car is loaded, nor more than 3 feet 9 inches when it is empty.

3. That when double dead-blocks are used that their vertical height and their width, measured crosswise to the track, be each 8 inches, and their thickness, measured lengthwise to the track, be 6 inches: that they each consist of a casting as represented by the drawing submitted with this report.

4. That when a beam, attached to the end-sill, is used for carrying the dead-blocks, that it may be made 36 inches long, 8 inches vertical depth, and not less than 4 inches thick.

5. That in other respects double and single dead-blocks be made in conformity to the standards heretofore adopted by this association, as shown in the drawings submitted with this report.

6. The committee also recommend that the nuts on the end of the truss-rods be seated in cup washers, so as not to project beyond the surface of the end-sill, and that the space between the ends of the cars be kept as clear as possible of bolt heads or other objects which are liable to catch the clothing or injure those engaged in coupling cars.

Mr. Cloud thought the recommendations in Section 6 not proper for letter ballot. Sections 1, 2 and 3 were important; perhaps 4 was important. A lengthy discussion showed that there would be many objections raised by various roads against altering present practice to conform to the standard of the association.

Mr. Forney, under unfinished business, brought up the question of the shape of the tread of car wheels. Some members thought the throat of flange should be ½"; others favored ⅝", and still others ¾" radius. The expression was generally in favor of the conical instead of cylindrical tread.

On automatic car couplers a long report was made by the committee. Their expression was one of doubt as to whether there was as yet any coupler which a railroad company could safely adopt. They thought that, as other roads would use other forms of couplers, the trainmen would be in greater instead of less danger. They thought the proper plan was to apply presumably the best couplers to a limited number of cars, and so find out the best, which would eventually be universally adopted.

Upon the report of the committee on Slipping of Wheels Mr. Kirby asked for a statement of the air pressure carried on different roads. On his road (the L. S. & M. S.) 70 lbs. pressure was carried, and still there was trouble with slipping wheels. The brake leverage was three to one. The discussion brought out the statement that 90 lbs. pressure was carried on some roads, because they found trouble in releasing the brakes. Others had no difficulty in releasing at 70 lbs. pressure.

Mr. Kirby said the trains which made the fewest stops slipped the wheels most.

Mr. McIlwain made the leverage so that the brake pressure on the wheels was five per cent. less than the weight on the wheels. This reduced the slip 75 per cent.

The committee on Subjects for Discussion at the next Annual Convention reported that they had so far prepared three subjects, viz.: The size of standard axles for 60,000-pound cars; Are the master car builders' standards uniform? Freight car roofs.

For officers for next year there being but one ticket, the secretary was instructed to cast the vote of the association for that ticket. The officers elected are as follows:

President: B. K. Verbryck, Chicago, Rock Island and Pacific.

Vice-Presidents: Wm. McWood, Grand Trunk; John W. Cloud, Pennsylvania Railroad; E. W. Grieves, Baltimore and Ohio.

Treasurer: John Kirby, Lake Shore and Michigan Southern.

Executive Committee, to serve two years: F. D. Adams, E. B. Packard, E. B. Wall.

The meeting next year will be either at St. Paul or Minneapolis.

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☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, JULY 10, 1886.

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The Master Mechanics Convention.

It was the nineteenth annual assemblage of the railway master mechanics at Boston on the 15th of June, and members came to the convention from twenty-five States, the District of Columbia, Canada and New Brunswick. Both the long railroads and the short lines were represented by their master mechanics. In fact, the convention was fully representative of the railroad mechanical interests. With additions to its membership bringing the total to over 270, and with a solid financial condition, the association keeps advancing as it leads improvements in railroad motive power and machinery.

The work of the regular committees was well done, as exhibited in the reports. Where answers to their circulars of inquiry were meager, they put forth extra efforts to prevent a deficiency. The committee on shop tools and machinery had asked but one question, in order to collate the results of experience in milling as compared with planing surfaces. But ten replies were received, most of them rather indefinite, yet the committee made the very suggestive report which we published last week. If it induces a few shops to adopt the "rotary planer" for surfacing certain kinds of work, it will have accomplished something decidedly beneficial.

It is noteworthy that the committee on shop tools fails to make any report about as often as it gets one completed. Last year none was made. For next convention no shop tools committee has been provided for. This is to be regretted, for the opportunities for improvement in railroad machine shops are greater than opportunities for improvement in the locomotive. The latter is up to a high degree of efficiency, but there is a wide diversity in methods and cost of making repairs, to which the association could well afford to devote some attention. Many railroad shops are not equipped to do work with proper economy, and the problem of turning out work promptly and at least possible cost gives master mechanics more concern than changes in the locomotive. The time must soon come when, with increased railroad earnings, repair shops will be better provided with tools and appliances for the work they have to do.

The voluntary topical discussions were, as usual, a prominent feature of the convention, and brought out a great deal of information. The committees' subjects for next convention are:

1st. To give best results what rule should be followed for proportioning the cylinders of an engine, when size of driving wheels, weight available for adhesion and boiler steam pressure are given quantities.

2d. Traction increasers, their various types and relative merits; also cases in which their use can be recommended.

3d. Packing—Various forms of piston packing in use, and results obtained; also, most econonomical and satisfactory packing for piston-rods, valve stem, regulator and air-pump stuffing boxes, with results obtained.

4th. Washing out and lighting up engines, showing best system in use for washing out, and most economical and expeditious mode of raising steam, and the necessary plant for same.

5th. Coaling up engines—The various plans in use, their relative cost and efficiency.

6th. Standard form of tire sections.

7th. What control has the man at the throttle over the wear of the driving wheel tire of the locomotive?

8th. Cross heads and guide bars; the various types in use; the materials used in their construction and the results obtained.

The election of Mr. William Woodcock, master mechanic of the Central Railroad of New Jersey, as president of the association, was a fitting honor to one of its most active and esteemed members. The selection of a place to hold the next annual convention is left to the Executive Committee, to decide between Minneapolis and St. Paul.

The manufacturers of bogus butter from oleo, tallow, lard, cotton seed oil, sterine and other greases and fats are a power in the land. Very few people who buy what is called "creamery butter" at the groceries have an idea of the immense money interest involved on the deception practiced upon them. Any legislation adverse to this fraudulent industry is fought with all the wealth accumulated by its prosecution. Some reputable newspapers howl against any attempt to tax or restrict the fraud. If all the imitation butter sold at retail were disposed of without any misrepresentation, so that the buyer would know just what he pays for, the production of that article would be so small that it would not interfere with dairy products anywhere. The industry is based upon fraud. If the fraud could be stopped the industry would go to the wall.

New York Industrial Reform.

The act of the last Legislature of the State of New York, to establish a State Board of Arbitration to decide labor disputes, when called upon by both parties to the contest, has been widely commented upon by the press. The act has really but little significance, as the Board has nothing more than advisory power. Another labor act passed by the same Legislature has considerable importance. It provides that no minor under 18 years of age, nor any woman under 21 years of age, shall be employed in any manufacturing establishment in the State for a longer period than sixty hours a week. No child under 13 years of age shall be employed, and every child under 16 years of age when so employed shall be recorded by name in a book kept for that purpose and a certificate of age, verified by parent or guardian, shall be furnished at request of an inspector. The fine for violation of the law is not less than $50 and not more than $100.

This is a law similar to those Massachusetts and Ohio have had in force for some years. It is wholesome in its provisions, and we hope it will be strictly enforced. There are but two inspectors to search for violations, while Massachusetts has twenty. Inspectors in Ohio and Massachusetts can make arrests, but in New York call attention of the proper authorities to abuses they find in industrial establishments. The chief inspector begins work in New York and Brooklyn July 5, and being interviewed by the Brooklyn *Eagle*, he says:

The sanitary condition of hundreds of establishments in New York and Brooklyn is wretched. The employes contract diseases while at work and carry them home to their families. In many places there are no safeguards against fire. All these matters must be looked into, and in our work we expect the hearty sympathy and co-operation of the press and the public.

He also says he expects to find many children under 13 at work in the factories, and proposes to abate this evil as well as others that exist. There is no doubt room for some active reform work in this direction, and the whole law-abiding public should sustain proper efforts to enforce the provisions of the Legislative act.

Cost of Locomotive Repairs.

Railroad managers, particularly those who manage the mechanical departments, are interested in knowing the exact cost of repairs on other roads than their own. If comparisons between different roads could always be satisfactorily made they would undoubtedly be of advantage as affording some basis upon which to work for a possible reduction of operating expenses. But it is evident that differences in the plans upon which the cost of repairs is calculated frequently makes the repair account of but little value as means of comparison between different roads, and often of but little more use to the road for which it is made. On some roads, under repairs is included everything necessary to keep up in good running order the full number of engines used. This will include building engines outright to take the places of those sent to the scrap heap; unless the total number is added to it is all counted as repairs. On other roads, particularly on small roads, it may be, and frequently is, the practice to purchase outright a good many of the parts used in repairs. This cost we have reason to know does not always find its way into the repair account, so between two roads pursuing these different plans, it is plain that no intelligent comparison of the cost of repairs can be made. What would be desirable is exact uniformity in respect to repair accounts. Even with this it may happen that on one road the motive power is, through insufficiency of help, allowed to gradually run down, while on another it is being gradually brought into better condition. Manifestly this would tell against exact comparison, but on the whole it would not amount to much. If locomotives are allowed to run down, repairs will soon cost more than if they are kept steadily up to a good standard, so altogether the advantage in showing should be in favor of the road that keeps to uniformly good conditions. The main argument is in favor of such a uniformity of statement as will leave nothing in doubt.

A daily paper reports the Atlantic Squadron as being under sealed orders to proceed to the scene of the recent fishery troubles. It is further remarked that the fishermen will protect the Navy while upon the excursion.

Commodore Braine has been instructed by Secretary Whitney to make a list of vessels of the merchant marine that would be useful as additions to the Navy in case of an emergency. It appears that a good deal of stress is laid upon the kind of engines a vessel is fitted with, but if the Commodore is correctly reported, it is evident he should be required to improve his knowledge of steam engineering before implicit faith is placed in his judgment on this part of the subject. He is reported as saying, in effect, that vessels fitted with triple compound engines only used one-third as much fuel as those with single cylinders. Nearly everyone believes in the economy of compound engines, especially for sea-going vessels, but when the saving by their use is set down at 66⅔ per cent., it shows lack of knowledge on the part of the one making the statement. If the Commodore will take the best performance in regard to fuel economy of the steamship Hudson, of the Cromwell Line, then divide this by three and compare the result with the best performance of a vessel fitted with triple compound engines, he will find it a very good lesson to begin with. He also speaks of boilers in steamships carrying 300 pounds pressure as if it were rather a common affair. It would be interesting to know how many such vessels he finds in the American merchant marine.

Literary Notes.

MODERN STEAM ENGINES. An elementary treatise upon the steam engine, written in plain language, for use in the workshop as well as in the drawing office. Giving full explanations of the construction of modern steam engines, including diagrams showing their actual operation, together with complete but simple explanations of the operations of various kinds of valves, valve motions, and link motions, etc., thereby enabling the ordinary engineer to clearly understand principles involved in their construction and use, and to plot out their movements upon the drawing-board. By Joshua Rose, M. E. Illustrated with 420 engravings. Price, $6, free by mail. Published by Henry Carey Baird & Co., 810 Walnut street, Philadelphia, Pa.

The author of this book evidently started out to make the subject plain to all classes of readers; we think the verdict will be that he has succeeded. There is enough of complexity in the valve mechanism of most steam engines to make the operation of the valve a subject not always readily comprehended. To those who have spent years designing and working out and over valves and valve motions the intricacies are so well understood that when they come to write on the subject they are likely to take it for granted that the reader knows many things, which, as a matter of fact, he knows nothing about. For a few readers a mere hint may be enough to control investigation, and the leaving out what may appear to the writer too simple to need explanation may not be a matter of much consequence. But with the vast majority of readers—busy men, without much time or inclination for investigation—these omissions are likely to prove fatal to the utility of the work. Very few readers of practical works

on mechanical matters are likely to complain that the subject is too comprehensively or clearly presented. The author has made no mistake in considering that everything relating to valves and valve motions that at all enter into his discussions should first be clearly explained.

The first chapter classifies steam engines, and describes the common slide-valve engine, defining lap, lead, travel, etc., and showing, to some extent, the effect of changes in them.

Following this is a long chapter showing how to employ diagrams for designing valve mechanisms. It seems to cover the ground in such a way as to give ready answers to many questions that puzzle engineers, and can be studied to excellent advantage. The more complicated forms of valves and valve motions, such as adjustable cut-off, link motions, etc., are gone over with in the same detail.

A large variety of modern steam engines are illustrated, and their construction and operation described, particularly with reference to the valve gears. Condensers, steam pumps, compressors, and a variety of steam-operated machines are also taken up and described. The book is one likely to be of value to every one interested in steam engineering.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(259) P. B., Ottawa, Canada, asks: Will you give me some information about sharpening drills for boring rock? *A.*—See our issues of January 2 and 9, 1886.

(260) H. B., New Orleans, La., writes: I am using hickory strips, 1"x¾", for making ribs of a small boat. My strips are straight. How can I bend them into shape for the boat, which has a round bottom? *A.*—Construct a box large and long enough to contain the whole or part of the strips to be bent. Force steam into the box, either from a boiler or from a large kettle, fitted with a close cover, which may be made of wood and cemented in for permanent use for the purpose. Steam the strips until they bend readily. A little experience will determine the amount of steaming required. Make a form the required shape to which ribs are to be bent. Force the strips on this form while hot and steaming, and fasten them securely to the form or model. Leave until dry, and the strips will retain their shape after being removed.

(261) J. G. S., Parkersburg, W. Va., will find rules for calculations about safety valves in the AMERICAN MACHINIST of Dec. 6, 1884.

(262) J. L. R., Keysburg, Ky., asks what horse power will a three-ply 7" rubber belt transmit, run horizontally on pulleys 20 feet apart; driver, 36" diameter; driven pulley, 12" in diameter, 8" face; driver running 200 revolutions? *A.*—About 28 horse-power. 2. What power would a four-ply 8" cotton belt transmit, run on pulleys as above? *A.*—We should not depend upon the 8" cotton belt for more than 28 horse-power. 3. Will an engine 6"x9", run 200 revolutions per minute, 75 pounds boiler pressure, drive a 40" 9-gauge circular saw? *A.*—No; not to give perfect satisfaction. Such a saw would require at least 10 horse-power, while the engine described as above could be relied on for that power.

(263) J. B., ——, asks: Can a foreigner, after he has declared his intentions to become a citizen of the United States and taken out his first papers, legally have an article patented as a citizen of the United States? *A.*—Everybody stands upon precisely the same footing as to taking out patents in the United States. All that is necessary is that you give your residence. You need not refer to the fact whether you are or are not a citizen.

(264) L. W., Providence, R. I., asks: 1. In what number of the AMERICAN MACHINIST can I find a way to compound gears for screw cutting? *A.*—Oct. 15, 1881. 2. I want a shaft on a mule to make 240 revolutions. This shaft has a 14" pulley. The line shaft runs 200 revolutions What size pulley should I put on the line shaft? *A.*—Multiply the desired speed of mule shaft by the diameter of pulley on it, and divide the product by the speed of line shaft. The quotient will be diameter of pulley on line shaft. Thus, 240×14=3360; this, divided by 200, gives 16 8-10ths as the diameter in inches of pulley on line shaft.

(265) F. F. H., Boston, Mass., writes: I wish to know where the largest trip-hammer in the United States is located, whether at Bridgewater, Mass., or Nashua, N. H.? *A.*—The Nashua Iron & Steel Company write that their largest trip-hammer weighs about 11 tons, and, as computed by the U. S. Government, strikes a blow of 300 foot-tons. The Bridgewater Iron Co. write: "Our largest upright hammer is a single-acting Nesmith; weight of ram and die, 12 tons; drop or stroke, 10 feet, from which you can make your own deductions for force in pounds of blow. The largest helve-hammer is a 2,600 lbs. double-acting."

(266) I. T., Hamilton, Ontario, writes: Is there any way of removing oil from Italian marble? The oil is probably such as is used on car axles, and has been in the stone for about four years. *A.*—Some of the oil can be removed by boiling the stone for a number of hours in a solution of soda, caustic potash, or some other strong alkali. Doubtless the stone will remain somewhat discolored, even after persistent boiling and many washings in clean water.

(267) A. W. H., Portville, N. Y., writes: Am running a 2¼"x6" engine to drive elevator. The engine only runs one way. Is there any way by which we can make it reverse with one eccentric? *A.*—It can be done by mounting the eccentric loose upon the shaft, and arranging two stops which will hold the eccentric in the right position when running backward, as well as forward. To reverse the motion of the engine it is necessary to move the loose eccentric by hand from one stop to the other.

(268) J. C. S., Cleveland, Ohio, asks what firm builds the largest number of screw cutting lathes? *A.*—Write to lathe builders for such information as this. Procure their catalogues, and you will be in position to answer your other question. 2. Are there any arithmetics in existence whose text is purely mechanical? *A.*—Not to our knowledge.

(269) A. S., St. Paul, Minn., asks: What will be the consequence of running an engine 10"x18" 250 revolutions per minute, the crank shaft being ¼" below the center of cylinder, but otherwise square? *A.*—We do not think you would be able to detect it in the running of the engine.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Patent Att'y, H. W. T. Jenner, Washington, D. C.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, N.Y.

Edw. Sears, Wood Engraver, 169 William st., N.Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Tack, Wire and Shoe Nail Machinery. Wm. A. Sweetser, Brockton, Mass.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

"Modern Steam Engines," $6; "Mechanical Drawing Self-Taught," $4 Joshua Rose, Box 3306, N. Y.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Improved Labor-saving Upright Drills, 20-in. to 36-in., inclusive. Currier & Snyder, Worcester, Mass.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 93 John st., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

Curtis Pressure Regulators, Curtis Return Trap. Curtis Damper Regulator. See June 19, p. 12. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

Engine Lathes, Hand Lathes, and other fine tools, Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

C. L. Jackson & Co., successors to Jackson & Tyler, No. 54 German street, Baltimore, Md., machinery, tools and supplies, engines, etc. Lists and estimates furnished on application.

"Hints to Steam Users." A carefully prepared book on the care and management of steam boilers. Especially valuable to owners, engineers and firemen. Contains useful information, tables, rules, etc., etc. It is the best book ever issued for the price. Send 25 cts. in stamps to Steam Users Publishing Co., 30 Vesey street, N. Y.

St. John Improved Self-adjusting Cylinder Packing, for marine and stationary engines and locomotives; applicable to water, air, oil and ammonia pumps. For durability and minimum of friction, it is unexcelled. Send for pamphlet. Address, Balance Valve and Piston Packing Co., room 58, 280 Broadway, New York.

Patent Binders for the AMERICAN MACHINIST, holding a complete volume (52 issues), simple, neat, durable. Price $1, prepaid, to any part of the United States by mail. To Canada or foreign countries the price will be 75c.; purchasers pay express charges and customs duties. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2, post-paid. Published by John Wiley & Sons, 15 Astor Place, New York.

MANUFACTURES.

The City Council of Dawson, Georgia, has voted to establish water-works.

The Putnam Machine Co., Fitchburg, Mass., are building a new foundry.

The H. A. Ramsay Engineering Works, Baltimore, are adding an iron foundry to their works.

Robert Goelet will build a three-story factory, 20x54 feet, at 206 East Fiftieth street, New York.

Samuel C. Ridgeway is building a four-story brick factory on Fremont street, Baltimore.

Richard Church has purchased a lot 100x190 feet, at Birmingham, Ala., for a location for tool works.

At a special town meeting $1,200 was subscribed toward starting a fund to establish a slipper factory in Wellfleet, Mass.

Worcester, Mass., has not been pestered with labor troubles, and the machine shops are generally busy.

Lonoke, Ark., Oscada, Mich., St. Sauveur, Quebec, and Vera Cruz, Mexico, are seeking new water-works.

J. H. Jones, Talladega, Ala., will establish a shop for repairing machinery, and will also operate a foundry.

It is reported that John F. Stephens, of Rome Ga., will establish boiler works at Birmingham Ala.

J. T. Windsor & Co., Milledgeville, Ga., will establish a machine shop, and probably a hub and spoke factory.

The Chicago, Burlington & Northern Railroad has a permit to erect a $50,000 round-house and shops in La Crosse, Wis.

Bailey, Banks & Biddle are to erect a jewelry manufactory in Philadelphia, Pa., corner Twelfth and Sansom streets, to be five stories, 40x100 ft.

John B. Jeffrey, Brooklyn, N. Y., will build a factory 40x93 feet, six stories high, on Van Buren street, Brooklyn, N. Y., at a cost of $50,000.

The Laclede Car Manufacturing Company, of St. Louis, have erected an additional building shop 110x50 feet, and a new blacksmith shop 60x40 feet.

It is stated that a company with a capital of $1,000,000 has been formed at Woodlawn, Ala., to manufacture a patent box for a cotton gin for using ammoniated steam.

The Athens Woolen Mills, a chartered stock company, with capital stock of $50,000, has been organized at Athens, Tenn., and work on buildings will begin at once.

P. Blaisdell & Co., Worcester, Mass., are running their shop with 85 men full time. They make a specialty of lathes and drill presses, which have recently been improved.

A typographical error of one letter made us say, in a recent issue, that the pumping capacity of nearly 300 Worthington pumping stations is one million gallons daily. It should read one billion.

Hubbard, Bragg & Co., founders and mill machinery builders, at Oakland, Me., are driven with orders, and contemplate a large addition to their building and storing facilities in the near future.

The co-operative nail mill, at Steubenville, Ohio, will have to close down because the price of plate iron has risen. They expect to build a mill and make their own muck iron, when nail making will be resumed.

The Roanoke (Va.) Machine Works are running continuously night and day. Two gangs of men are employed. They build locomotives and cars, and do repairs. Several hundred hands are employed.

The Missouri Pacific Railroad Co. has purchased 68 acres of land at Dallas, Texas, on which, it is said, they will erect a large depot, and probably transfer their shops to that point.—*Baltimore Manufacturers' Record.*

Neafie & Levy, Philadelphia, Pa., are repairing the tugs Juno, Rattler and Nellie, and are putting shaft wheel and engines into a tug lately launched from Bereley's yard. They have just finished the steamer Newburgh to run on the Hudson.

Philadelphia is in need of additional water-works, which will cost upwards of $18,000,000, and the South Mountain water company has been found to build the same, and turn them over to the city at the end of 50 years.

H. L. Moorhouse and H. Wales Lines & Co., of Meriden, are to build the new factory for the Goodyear Rubber Company, in Naugatuck, Conn., of which ex-Governor English is president. The building will cost, for joiner and mason work, over $60,000.

The Pond Machine Tool Co., Worcester, Mass., are running full force and full time. They have sold more tools this year than for the whole of 1885. They are building a new frog planing machine, which will be extra heavy. Their new ten-foot boring mill weighs 50,000 lbs.

Geo. W. Silleox, 60 Barclay street, New York, has on exhibition a Korting gas engine, indicating 10 horse-power, built by Korting Bros., of Germany. It is proposed to import these engines for the present, until a company can be formed to manufacture them in this country. There are 12 sizes, ranging from 1 to 25 horse-power.

A correspondent writes us from the Lima Machine Works, Lima, Ohio: "We are rushed with orders in our shop. We are increasing our capacity, adding new and large machinery, and are compelled to work nights on our specialty—logging and mining locomotives. The new oil territory pipe causes considerable extra work.

The Chicago Safe and Lock Company reports so many orders in hand that it is unable to take large orders at present. The company has added an area of 80x128 feet to its main floor space, making the same 80x320 feet in size. These extensive works front on both Canal and Clinton streets, and are turning out 15 to 20 safes per day.—*Industrial World.*

New iron pipe works are to be erected at Chattanooga, Tenn. It will be one of the largest manufacturing establishments of the kind in the world. It is to be built by the proprietors of the Louisville, St. Louis, Cincinnati, and New Port Iron Pipe Works, and is to manufacture not only for this country, but for Japan and China and other foreign countries.

The Otis Iron & Steel Co., of Cleveland, have just finished the top section of the anvil block for a 15-ton hammer, now being built by the Morgan Engineering Company, of Alliance, for the Crescent Steel Works, of Pittsburgh. The section weighs 55,170 pounds. This is said to be heavier by more than 50 per cent. than any other steel casting ever made in this country.—*Industrial World.*

The Kensington Engine Works, Limited, are furnishing quite a number of their patent feed-water heater and purifiers. Recent shipments are one 12" exhaust to the Chester Electric Light & Power Co., Chester, Pa.; one 8" exhaust, Peoples' Electric Light & Power Co., Trenton, N. J.; One 10" exhaust Hughes & Patterson, Philadelphia; one 8" exhaust Chestertown Straw Board Works, Chestertown, Md.

Cramp & Son, Philadelphia, Pa., are building a new iron ferry boat, 207 feet long, with engine 50" diameter, 10 ft. stroke; a new steamer for the Morgan Line; repairing the English steamer "Eros," which went ashore last April; the repairs estimated to cost $50,000. The collier Hercules is undergoing a thorough overhauling on the railway. They are also building three new steamers for the Southern Pacific and Wm. P. Clyde & Co.

A company, to be known as the Amoskeag Indurated Fiber Co., incorporated by the last legislature, has been organized at Manchester, N. H., with a capital of $50,000. It is the purpose of the company to manufacture pails and other woodenware from pulp. Ex-Governor Cheney is president of the company, and Hon. W. L. Morrison, of Peterboro', clerk and treasurer.—*Boston Commercial Bulletin.*

The N. Y. *Tribune* has the following in regard to the iron trade at Cleveland: "The iron business shows a great many encouraging points. Although it is claimed by some that the Cleveland iron market has not recovered from the labor trouble, and is to-day in no better condition than at this time last year, still the more liberal iron men here look for a good volume of business to come, and give good reasons for it. All the local mills are running more heavily than they were three months ago. The shipments by lake have already doubled those for the same time last year, and the ore not contracted for shipment is being let freely It is moving just as fast to the furnaces and, best of all, the advanced prices of ore have not dropped off a single cent."

A company has been organized under the laws of New Jersey for the purpose of utilizing the mitis method of casting wrought iron, by which the qualities of ductility and malleability are retained. This method is also claimed as adapted to the manufacture of steel ingots, and is the invention of Prof. Nordenfeldt, of Sweden. Included in the syndicate are John Fritz, of the Bethlehem Iron Works; John T. Morris, of Philadelphia; Frederick A. Potts, of New York; R. H. Sayre, of the Lehigh Valley Railroad; E. P. Wilbur, of Bethlehem; R. C. Schenck, Jr., of Ohio; R. G. Salom, of Philadelphia; ex-Senator T. C. Platt, of New York, and ex-Governor Howard, of Rhode Island. The company will confine itself to the granting of licenses for the use of the process.

The Boston *Commercial Bulletin* says: "Work upon the Maine Central Railroad Shops, at Waterville, Me., will be immediately begun, and the building will be pushed forward as rapidly as possible. The shops will cost about $100,000, and the tools with which it will be necessary to furnish them will probably cost about another $100,000. The machine shop will be 100x300 feet, and will have eleven tracks for the accommodation of locomotives during the progress of repairs, each of the tracks being reached from a transfer table extending the length of the shop and operated by an engine located directly upon the table. At one end of this building will be a store room 40x65 feet. The blacksmith and boiler shop, 50x300 feet, will be a short distance in the rear of the machine shop. At one end of this building will be a pattern room, and at the other a tin shop and brass foundry. The passenger and freight car repair shop, 80x315 feet, will have sixteen cross tracks for the accommodation of cars during the progress of repairs. The wood-working shop will be 70x140 feet, and the paint shop 80x300 feet with eighteen cross tracks. All the buildings will be one story in height, except the wood-working and repair shop, which will be two stories. About 2,500 yards of masonry will be required for the foundation of the buildings, and 2,000,000 bricks will be consumed in their erection. The roof will be of iron, covered with slate.

Machinists' Supplies and Iron.

NEW YORK, June 24, 1886.

The outlook remains about the same as last week, except that a more hopeful feeling prevails.

Iron—In American Pig, consumers buy only for present needs to cover current requirements, but considerable product is absorbed by contract deliveries. We quote No. 1 X Foundry $18 to $18.50 for Standard Lehigh and North River brands; $17 to $17.50 for No. 2; and $16 to $16.50 for Gray Forge.

Scotch Pig—The market is dull, but production has been lessened by the blow-out of several furnances. We quote Coltness, $20; Glengarnock, $19; Gartsherrie, $19.50; Summerlee, $19.50; Eglinton $17.50 to $18; Langloan, $19.50, and Dalmellington, $18.50.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—First-class hand on Brown & Sharpe miller. Address "Baltimore," AM. MACHINIST.

Good machinist on clock or clock works; 5 years' experience. Address Gauge, AM. MACHINIST.

Wanted—A position as foreman boiler-maker by a practical man, who has been foreman a number of years; reference given as to ability, etc. Address W. T., AM. MACHINIST.

Wanted—Situation as superintendent or foreman of iron or agricultural implement establishment; qualifications and references the very best. Address X. X. L., AM. MACHINIST.

A thoroughly experienced machinist wants a position to take charge of repairs to engines and machinery in rolling or other mills; 15 years' experience; age, 29; first-class references. "S. J.," AM. MACHINIST.

Wanted—To represent the State of Florida, as State agent, for any saleable article or matter; can control trade of entire State; thoroughly established; greatest experience; correspondence solicited. Address Lock Box 56, Jacksonville, Fla.

A technically educated man, having practical experience in shop, office and drawing room, desires a situation where theoretical and practical knowledge will be of use; highest recommendations. Address T. Williams, AM. MACHINIST.

Wanted—Situation by a first-class pattern-maker and draftsman; 26 years' experience in engines and general machinery; 12 years as foreman and manager; age, 40; married; good references. Address Patterns, AM. MACHINIST.

Wanted—Traveling salesman selling to steam users, machinery and mill supply houses and the hardware trade, to write for my terms and commission on some fast-selling articles. Address J. L. K., AM. MACHINIST.

Wanted—A first-class foreman for a machine shop employing 200 men; situated in Ohio; building automatic steam engines up to 1,000 H.P.; he must understand thoroughly how to handle men, and expeditious in getting out work; none but a live, experienced man need apply; a liberal but not extravagant salary will be paid. Address, stating age, experience, and salary expected, Ohio, AM. MACHINIST.

Wanted—Foreman for printers' machine shop; a man capable to superintend repairs of all kinds on presses, cutters, etc.; also general jobbing and constructing; one with some cash can have interest; business has been established several years; has good run of trade; modern tools in shop, and experienced men only employed; references required. Address "Printers' Machinist," AM. MACHINIST.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent Boiler Compound; ever reliable, never failing. Crescent Mfg. Co., Cleveland, Ohio.

Steel stamps, stencils, burning brands, and brass checks. T. M. Parker, Hartford, Conn.

Light mach'y of all kinds built at short notice. Edmund Mills, 8 Dey st., Jersey City Heights, N. J.

Send for estimates of high-speed compound engines for stationary and marine service. Crist Engine Works, 140 Baxter treet, N. Y.

Useful information steam users and engineers 100 page book on care, etc., of boilers. Send 25 cents in stamps. J. N. Mills Pub. Co., 30 Vesey st., N. Y.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. Weston & Smith, Syracuse, N. Y.

To rent, with machinery, tools and fixtures, new brick shop, with water front, near New York; fine location for doing marine engine work. Address Box 15, AM. MACHINIST.

For Sale—10×20 horizontal engine, cut-off valves, heater, pump, etc., complete; this engine has been in use 3 months, and is a finely built engine; made by Whitehill, of Newburgh, N. Y., and for sale cheap. Shultis & Co., Kingston, N. Y.

M. Martin, manufacturer, P. O. Box 285, New Brunswick, N. J., will contractfor the manufacture of articles in brass and other metals (stamped or turned), and dies and tools for making same; also patent novelties, electrical inventions, special machinery castings, etc.; estimates cheerfully given.

For Sale—A well established foundry and machine shop, including lots, buildings, machinery, patterns, and stock on hand, situated in Logan, Hocking Co., Ohio; will sell on easy and satisfactory terms; reason for selling—old age and ill health. Apply to R. Belt, Logan, Ohio.

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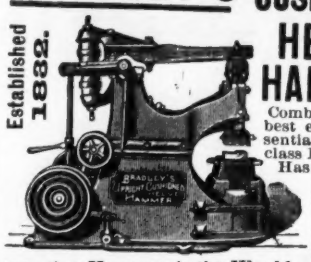
Established 1832.



Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other Hammer in the World.

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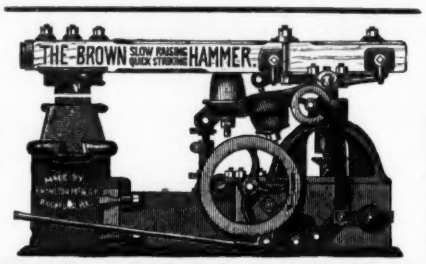

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A NEW MOVEMENT! SEND FOR DESCRIPTION.

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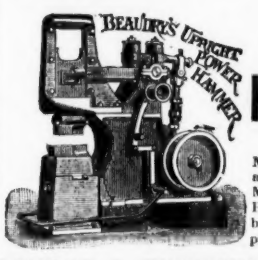

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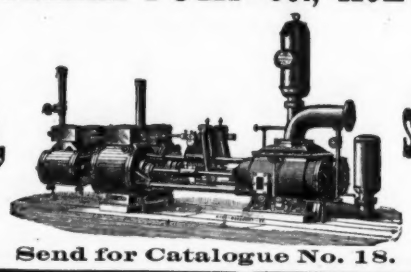

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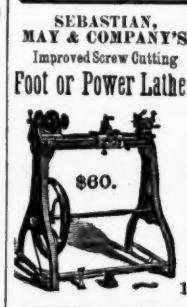

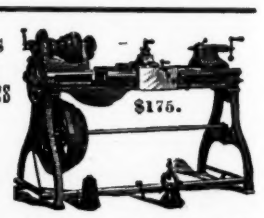

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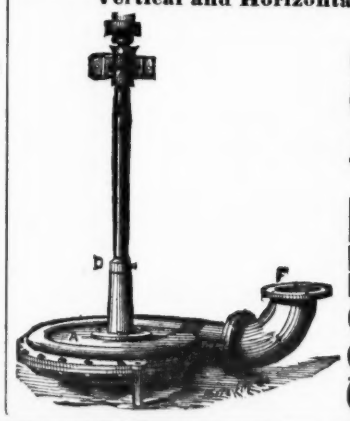

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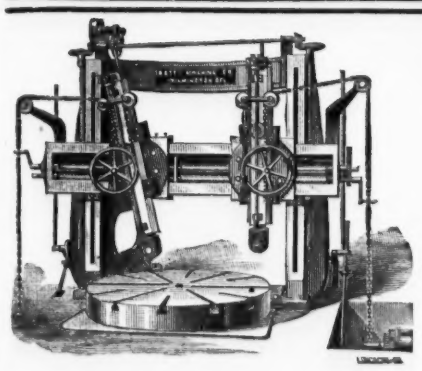

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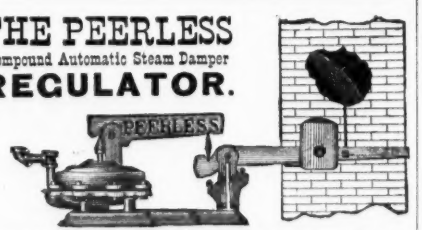

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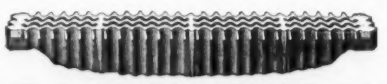

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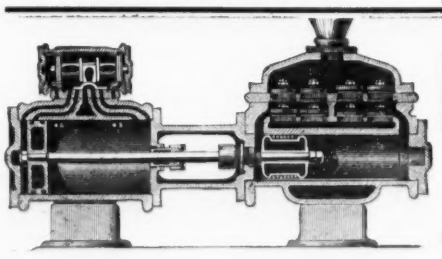

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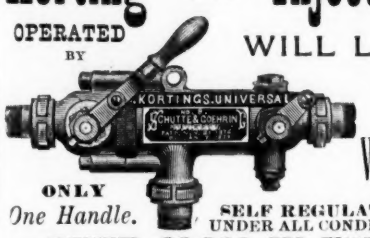

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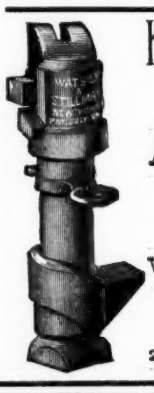

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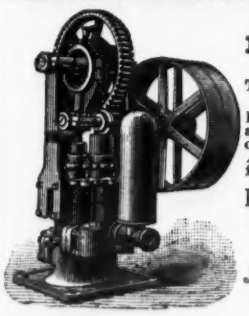

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Efficient, Safe and Inexpensive.

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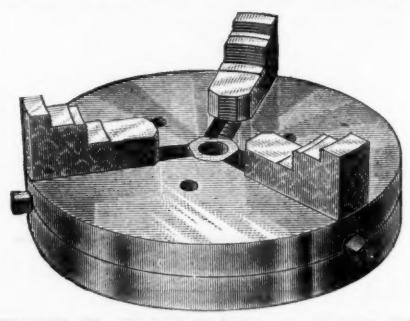

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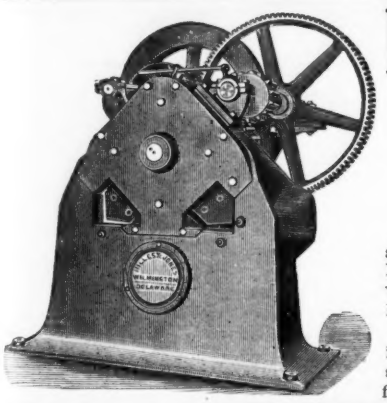

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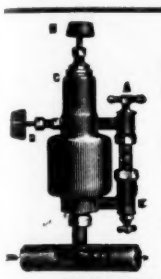

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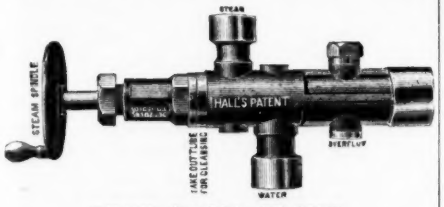

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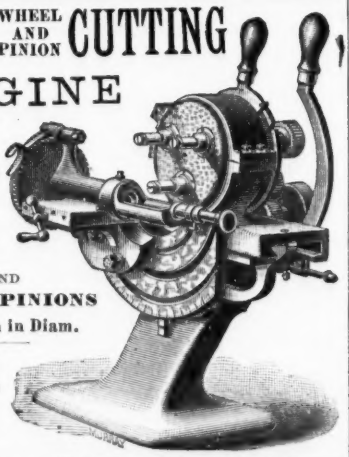

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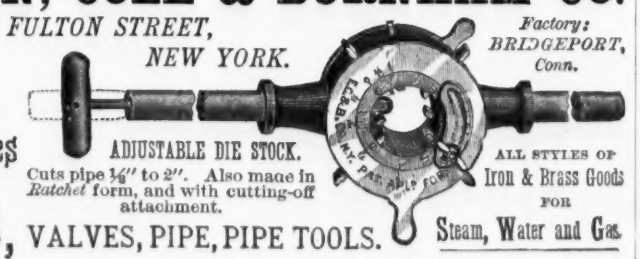

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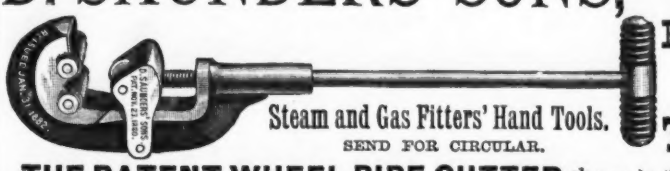

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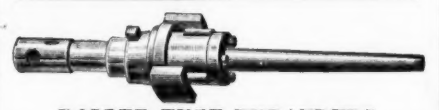

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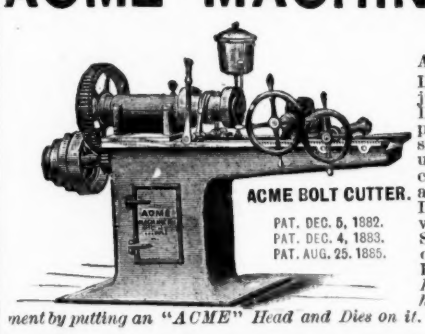

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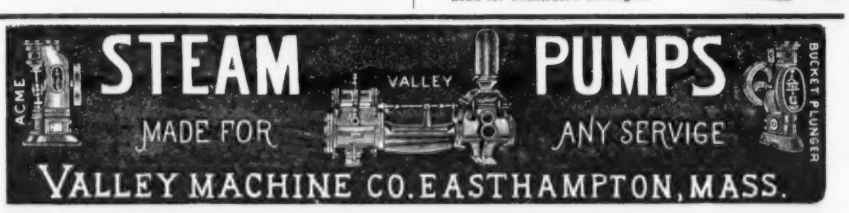

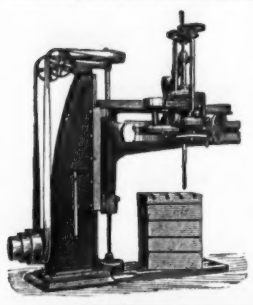

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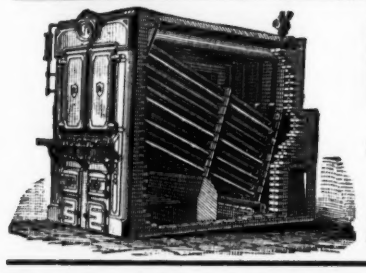

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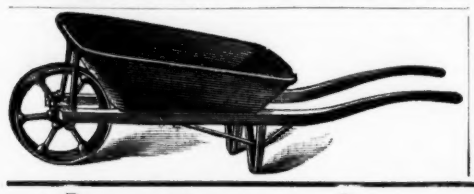

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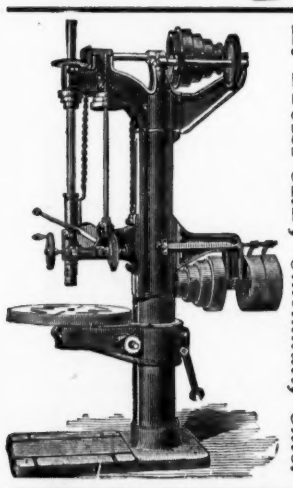

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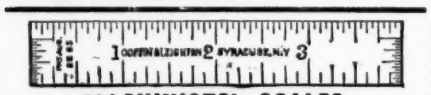

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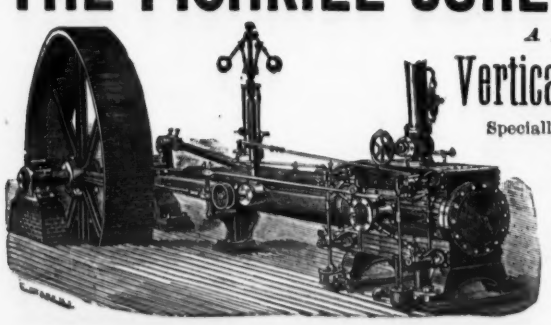

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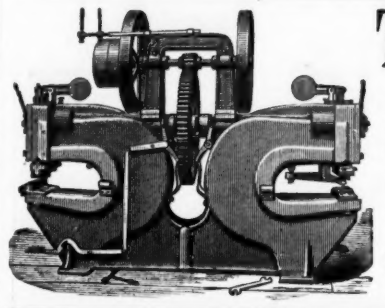

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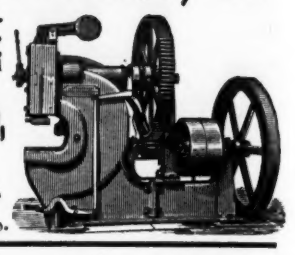

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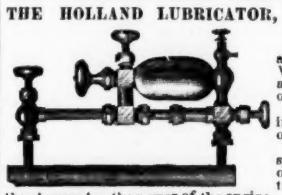

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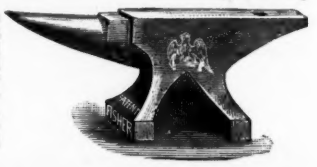

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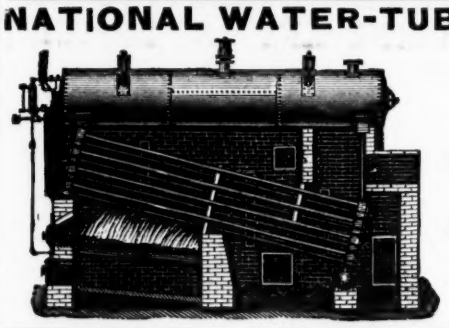

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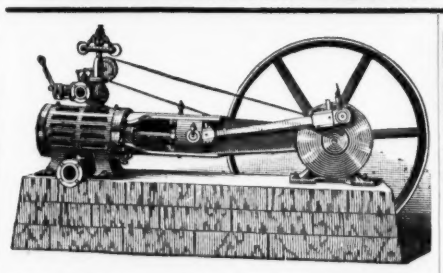

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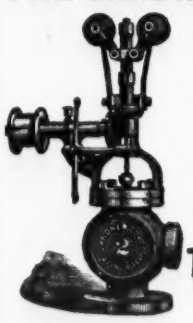

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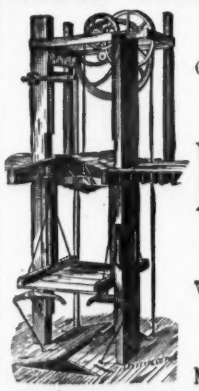

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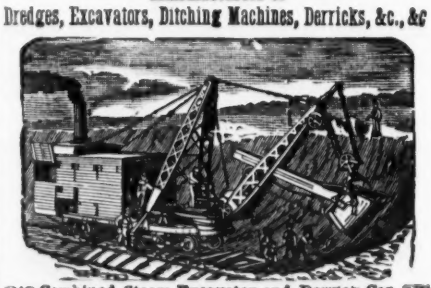

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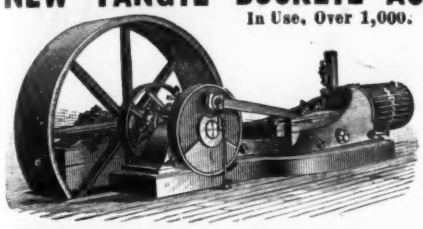

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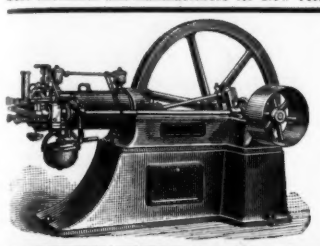

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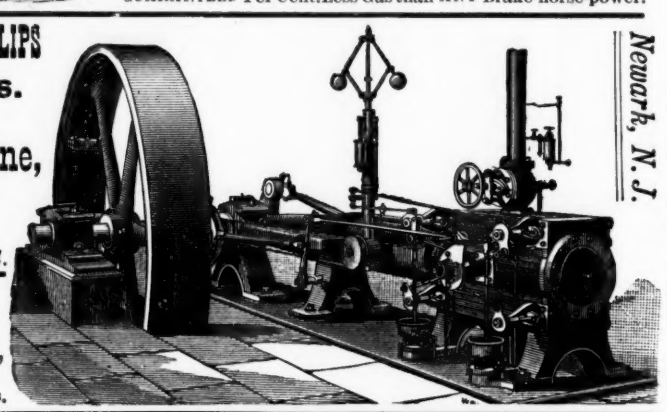

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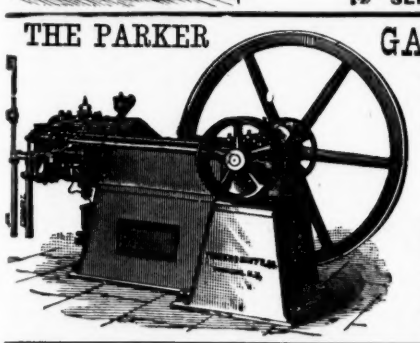

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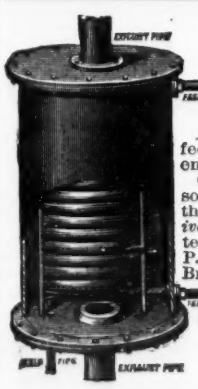

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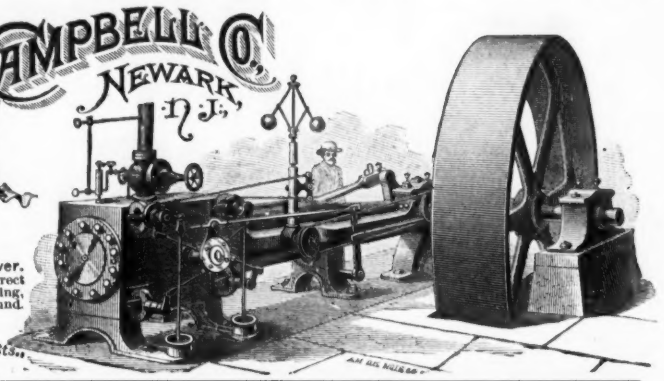

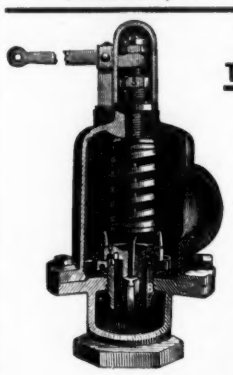

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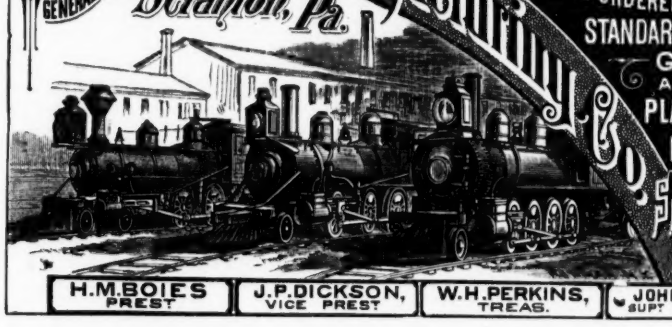

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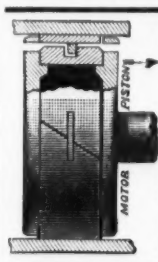

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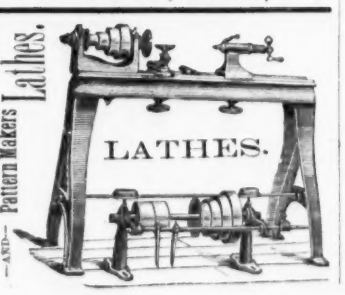

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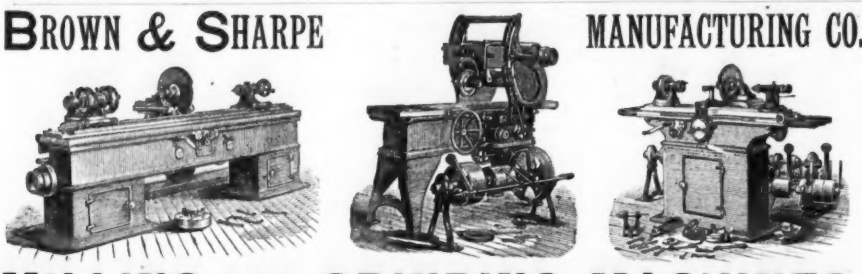

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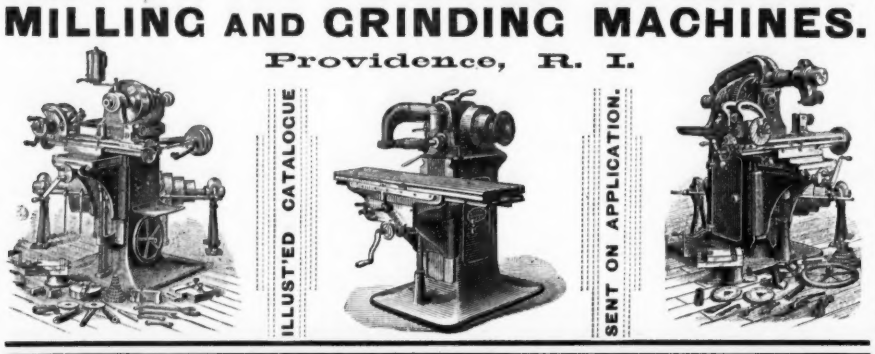

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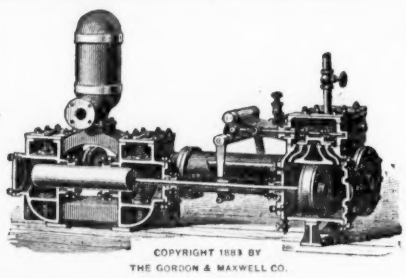

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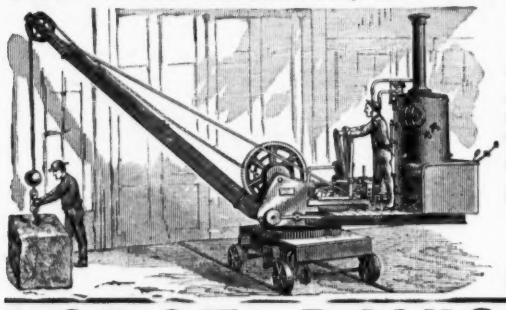

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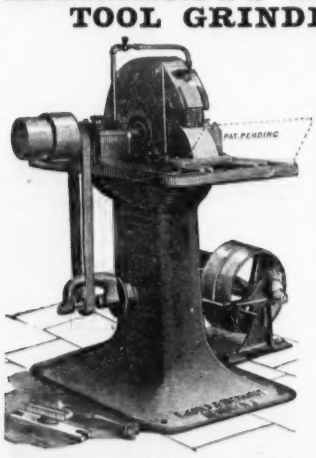

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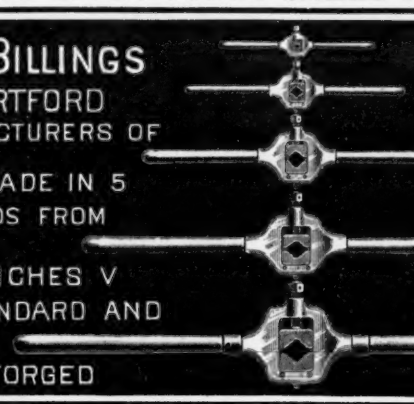

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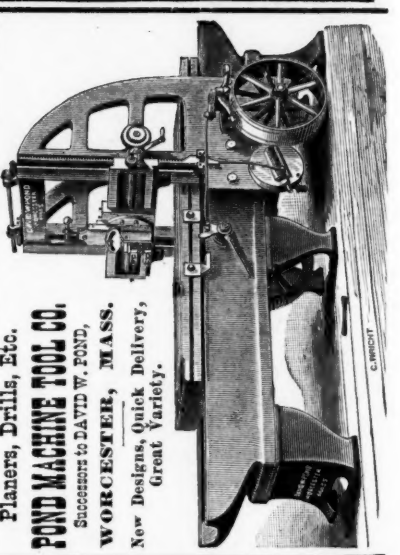

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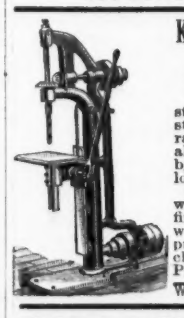

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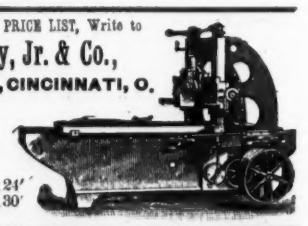

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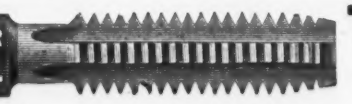

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